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DIST.	LTR	ENC
CON, R.F.		
NSUSSEN, S.J.		
ORMOLINI, A.M.		
RAILSFORD, M.D.	X	X
URDGE, L.		
ARD, R.G.		
OSGROVE, M.M.		
RAWFORD, A.C.		
EJONG, V.J.		
ERBY, S.		
IETERLE, S.E.		
ERRERA, D.W.	X	X
ERRERA, K.P.		
ULTON, J.C.	X	X
ERMAIN, A.L.		
ILPIN, H.E.		
ARDING, W.A.	X	X
ARROUN, W.P.		
EDAHL, T.G.		
ILL, J.A.		
EWIS, M.R.		
ARTINEZ, L.A.		
ORTH, K.		
PARKER, A.M.	X	X
PHI[illegible] E.J.		
PC		
RO[illegible] D.		
RUSC[illegible] G.	X	X
SHELTON, D.C.		
SNYDER, D.P.	X	X
SPEARS, M.S.		
TUOR, N.R.		
VOORHEIS, G.M.		
Miller, J	X	X
[illegible], C	X	X
Martinez	X	X
Snyder, R	X	X
COR. CONTROL	X	X
ADMN. RECORD		
PATS/T130G		

Reviewed for Addressee
Corres. Control RFP

12/1/98 DK
Date By

Ref Ltr. # 02243

DOE ORDER # 548022

AME:ABD:MER:03196

Rocky Flats Environmental Technology Site Safety Analysis Report, Revision 0

Wynn A. Harding, Vice President
Safety Systems and Engineering
Kaiser-Hill Company, L.L.C.

Reference: Letter, Harding to Klein, 98-RF-02243, dtd 4/29/98, subject: Rocky Flats Environmental Technology Site Safety Analysis Report, Revision 0 - WAH-135-98

The Rocky Flats Field Office (RFFO) has reviewed and approves the Rocky Flats Environmental Technology Site (Site) Safety Analysis Report (SAR), Revision 0, Volume I and the Facility Safety Analysis (FSA) for Building 881 in Volume II transmitted in the referenced letter. Building 881 is the only nuclear Hazard Category 3 facility included in the Volume II FSAs.

The Site SAR concept was deemed necessary to 1) identify the infrastructure systems inherently relied upon in the other nuclear Hazard Category 2 and 3 Facility authorization basis (AB) documents, 2) cover the risks and controls for on-site transportation of nuclear and hazardous materials, and 3) identify the Site-wide composite risks in order to have a basis against which to screen future Site-wide discovery issues and aid risk managers in their decision making process for providing a Site-wide risk perspective. In addition, the Site SAR, along with the implementation of Integrated Safety Management (especially the Activity Screening Process), will allow for the cancellation of the Master Activity List once the Site SAR is implemented. Building 881 is a Hazard Category 3 nuclear facility and unlike other Hazard Category 3 facilities that have their own AB document, Building 881 is included in Volume II of the Site SAR.

More recently, an issue revealed during the final phase of the Review Process indicates that "ownership" of the Site SAR may not be adequate which has caused a delay in resolution of significant issues primarily associated with implementation. To date, there appears to be a lack of understanding on how the Site SAR will be implemented as well as how noncompliances will be identified, tracked, and trended. While this will not prevent approval of the Site SAR, the RFFO expects clear leadership, vision of implementation and direction within K-H and down through its primary subcontractors.

The attachment summarizes the RFFO review of the Site SAR, the basis for approval, and further direction by RFFO. The Site SAR should be included in the AB Document List for

Site activities and for each Hazard Category 2 and 3 facility as of the date of this memorandum.

This stated technical direction is not intended to impact the cost, schedule, or scope of the contract. If you believe there will be such an impact, you should immediately notify the Contracting Officer's Representative and the Contracting Officer and not implement the technical direction received. Should you have any questions, please contact me at extension 5878, or my point of contact on this matter, Mary Regan, at extension 5041.

for Keith A. Klein
Deputy Manager for Technical Programs

Attachment

cc w/Att:
P. Bubar, EM-64, HQ
M. Sautman, DNFSB
D. Lowe, AME, RFFO
M. Weis, AMPA, RFFO
H. Dalton, AMMSD, RFFO
J. Legare, AMEC, RFFO
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C. Dan, CMD, RFFO
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D. Snyder, K-H
D. Ruscitto, K-H
J. Miller, K-H

Review Report for the Rocky Flats Environmental Technology Site
Safety Analysis Report, Revision 0

RFFO Approvals:

Mary E. Regan, Review Team Leader,
Prepared Review Report

Terry Foppe,
Prepared Composite Risk and Transportation Review

11/19/98

Shirley J. Olinger, Director
Authorization Basis Division, Reviewed
Review Report

As Signed 11/20/98

David Lowe, Assistant Manager for Engineering
Approved Review Report

TABLE OF CONTENTS

1.0 INTRODUCTION

This Safety Analysis Report (SAR) Review Report documents the U.S. Department of Energy Rocky Flats Field Office (RFFO) review and bases for approval of the Rocky Flats Environmental Technology Site (Site) SAR Volume I, the Building 881 Facility Safety Analysis (FSA) and the Site Operational Controls.

The current mission at the Site is to provide safe storage and management of wastes and special nuclear material with the goal of reducing existing hazards and decommissioning existing facilities. These activities include the consolidation and stabilization of nuclear materials, removal of hazardous materials, decontamination, decommissioning, and environmental restoration. The Site SAR supports these activities by:

- providing a hazard assessment for Site facilities /systems/activities that have not been previously documented (of significance is the inclusion of on-site transportation and the Building 881 FSA),
- providing a cost effective means to document and control remaining facility hazards following risk reduction activities, and
- identifying the safety management programs and other administrative controls (e.g., inventory controls) needed to assure the continued safe operation of specific facilities.

The Site SAR concept was deemed necessary to 1) identify the infrastructure systems inherently relied upon in the other nuclear Hazard Category 2 and 3 Facility authorization basis (AB) documents, 2) cover the risks and controls for on-site transportation of nuclear and hazardous materials, and 3) identify the Site-wide composite risks in order to have a basis against which to screen future Site-wide discovery issues and aid risk managers in their decision making process for providing a Site-wide risk perspective. In addition, the Site SAR along with the implementation of Integrated Safety Management (especially the Activity Screening Process) will allow for the cancellation of the Master Activity List (MAL) once the Site SAR is implemented. Building 881 is a Hazard Category 3 nuclear facility, and unlike other Hazard Category 3 facilities that have their own AB document, Building 881 is included in Volume II of the Site SAR.

The Site SAR concept was utilized to provide safety documentation for nuclear Hazard Category 3, non-nuclear, radiological facilities, industrial facilities and environmental restoration to reduce the duplication of information, which would be needed if all facilities had a stand alone safety document. The single document concept also allows easier, less expensive updating of information and analyses. With the changing mission of the Site, and as a result, the changing mission of individual facilities, an authorization basis is needed to ensure the safe operation of individual facilities and the Site as a whole. Therefore, the Site SAR adapted the applicable portions of DOE-STD-3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports* (Reference 1), DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports* (Reference 2), DOE-STD-3011-94, and *Guidance for Preparation of DOE 5480.22 (TSR) and DOE 5480.23 (SAR) Implementation Plans* (Reference 3) for use in the determination of the hazard categorization of facilities and information content.

The format and content of the Site SAR Review Report is based on the guidance provided in DOE-STD-1104-96, *Review and Approval of Nonreactor Nuclear Facility Safety Analysis Reports* (Reference 4). The criteria were also modified to account for the fact that the Site SAR was developed through adapting Reference 1 to meet the goal of a Site SAR versus a facility SAR.

Section 2.0 of the Site SAR Review Report provides the Summary Conclusion of the Review Team concerning the adequacy and acceptability of the Site SAR.

Section 3.0 of the Site SAR Review Report discusses the review process used by the Review Team in determining the acceptability of the Site SAR and Operational Controls.

Section 4.0 of the Site SAR Review Report provides a brief description of the scope of activities and facilities included in the scope of the Site SAR.

Section 5.0 addresses the adequacy of the Site SAR in meeting the qualitative acceptance criteria derived from Reference 4 including a discussion of the major issues identified during the RFFO review and the bases for RFFO's approval of the Site SAR and its Operational Controls. Only the transportation chapter (Chapter 8), composite risk (Chapter 9), propane/natural gas explosion analysis, and the FSAs contain authorization basis accident analysis. Since, the Building 881 FSA is the only FSA for which RFFO is the approval authority, this is the only Building FSA covered by this Review Report. The review results of the on-site transportation analysis are presented in Appendix A of this Review Report and provide the bases for RFFO's approval of the on-site transportation risks and controls. The hazard categorization for facilities currently classified as Hazard Category 3 or higher has been previously reviewed and approved by RFFO. However, the RFFO has performed a high-level review of the hazard classifications for facilities below Hazard Category 3. While this high-level review has not revealed any immediate concerns, the RFFO will complete this review prior to implementation of the Site SAR.

Section 6.0 of the Site SAR Review Report completes the body of the report with a list of references.

Appendix A presents the results of the RFFO review of on-site transportation (Chapter 8). Appendices B and C present immediate and future required changes to the Site SAR resulting from RFFO's final review of the document, respectively. Appendix D identifies issues which are to be resolved upon Site SAR implementation. Appendix E identifies the Review Team members, their level of participation in the review process, and their relevant experience.

2.0 SUMMARY CONCLUSION

The Review Team concluded that the Site SAR along with the RFFO technical direction in Appendices B, C, and D adequately defines and analyzes the hazards associated with the Site as a whole (composite risk), identifies the expected Site infrastructure operational controls, identifies the hazards and controls necessary for Building 881 in its FSA, and analyzes the hazards and controls for on-site transportation. The preventive and mitigative features and the controls specified in the Operational Controls adequately reduce the risk to the public, collocated workers, and immediate workers to a level consistent with the guidelines provided in DOE-STD-3011 (Reference 3), consistent with the risks of the other Site facilities, and acceptable to the Review Team. The bases for this conclusion is presented in Section 5.0. The Review Team recommends RFFO approval of Revision 0 of the Site SAR including the Site Operational Controls contained in Chapter 7 of the SAR and the FSA for Building 881 with the inclusion of the RFFO technical direction included in Appendices B, C, and D.

In developing the FSA hazards analysis for Category 3 nuclear and non-nuclear facilities and for the on-site transportation risk assessment, four risk classes for accident scenarios were defined: Risk Class I (major), Risk Class II (serious), Risk Class III (marginal), and Risk Class IV (negligible). This methodology is based on DOE STD-3011 and has been or is being used for development of Category 2 nuclear facility ABs. The Risk Classes are based on the frequency of occurrence of the event and the consequences of the event as defined in Table 2-1 below.

Table 2-1. Risk Classes-Frequency versus Consequences

Consequence	Frequency of Occurrence (per year)		
	Extremely Unlikely $<10^{-4}$	Unlikely 10^{-4} - 10^{-2}	Anticipated $>10^{-2}$
High	II	I	I
Moderate	III	II	I
Low	IV	III	III

Table 2-2 shows how High, Moderate, and Low were defined for radiological accident consequences and Table 2-3 defines chemical accident consequence levels.

Table 2-2. Radiological Accident Consequence Levels (50 year CEDE)

Consequence	Public Dose (rem at Site Boundary)	Collocated Worker Dose (rem at 100 m)	Immediate Worker Dose
High	>5	>25	prompt death
Moderate	>0.1	>0.5	serious injury
Low	<0.1	<0.5	<moderate

Table 2-3. Chemical Accident Consequence Levels

Consequence	Public Exposure (at Site Boundary)	Collocated Worker Exposure (at 100 m)	Immediate Worker Exposure
High	>ERPG-2	> ERPG-3	prompt death
Moderate	N/A	N/A	serious injury
Low	< ERPG-2	< ERPG-3	<moderate

In Table 2-3, N/A means Not Applicable and ERPG refers to the Emergency Response Planning Guidelines published by the American Industrial Hygiene Association. ERPG-1, ERPG-2, and ERPG-3 define the air concentrations for each chemical corresponding to low, moderate, and severe health effects in humans exposed for greater than one hour.

Volume II of the Site SAR provides the FSA for facilities or operations (including Site-wide systems) identified to be nuclear Hazard Category 3, radiological, non-nuclear moderate or low, industrial, or environmental restoration. The FSAs contain hazards analyses which identify chemical and radiological hazards, and provide the basis for identifying the operational controls required to maintain acceptable risks from facility operations to facility personnel, collocated workers, the general public and the environment. The hazard classification of the non-nuclear facilities was performed using DOE-EM-STD-5502-94, *Hazard Baseline Documentation.*

2.1 EVALUATION OF COMPOSITE RISK FROM ACCIDENTS

Chapter 9 of the Site SAR presents a quantitative analysis of Site-wide composite risks in order to aid risk managers in their decision making process by providing a Site-wide risk perspective and to have a basis against which to screen future Site-wide discovery unreviewed safety question (USQ) issues. This section first discusses the best estimate of risks from accidents based on median weather dispersion. Then, a summary of seismic risks from Hazard Category 2 nuclear facility ABs based on 95% weather are presented, along with considerations for performing Site-wide USQ determinations.

2.1.1 MEDIAN ESTIMATES OF COMPOSITE RISK

In addition to providing hazard analyses for facilities reflected in FSAs, the Site SAR provides Site composite accident analyses of the three dominant Site risks:

- Seismic accidents being the most dominant (96%)
- Fire accidents that are unfiltered (e.g., Low-Level Waste storage and plutonium building dock fires dominating the fire risk) (2%)
- Spill accidents that are unfiltered (e.g., the major contributor being oxides and residues staged on plutonium building docks) (2%)

The composite risk assessment (Chapter 9) is based on the accident analysis documented in the Rocky Flats Cumulative Impacts Document (CID) (Reference 5) which was issued by RFFO in June 1997. The CID presents the best estimate of risk through extraction of accident data from existing AB and environmental impacts documents and

bounding accidents using median weather rather than 95% weather. The composite risk does not drive the development of TSR-level controls. The CID was developed as a tool to be used by risk managers in the decision making process. In addition, RFFO expects the Site SAR composite risk analysis to form the bases for future Site-wide discovery issues or against which proposed changes to be screened. The analysis presented in Chapter 9 updates the CID seismic data and resulting analysis for Building 707 based on the corresponding discovery USQD.

The consequences from a plutonium release are quantitatively estimated as a 50-year CEDE radiological dose (rem) to an on-site or off-site individual or latent cancer fatalities (LCFs) in the surrounding population. Chapter 9 presents the Site inventory as of June 1996 of 12.7 metric tons (MT) of plutonium. The following is the specific distribution by building which was used for the Baseline Case Material at Risk (MAR) (Reference 6). However, RFFO recognizes that these inventories do not reflect the current building inventories since the plutonium metal and oxide and residues have been removed from Building 771, only holdup remains in Building 779, and the Highly Enriched Uranyl Nitrate has been drained from the tanks in Building 886. This is addressed in Appendix C for incorporation into the next annual update.

Table 2-4. Unclassified Approximations of Plutonium and Enriched Uranium by Building

Building	Enriched eU (kg)	Plutonium (kg)					
		Metal and Oxide	Solid Residues	Liquid Residues	TRU Waste	Subtotal	Estimated Holdup
371/374	2,300	5,700	1,900	<5	20	7,625	30
559		<2				<2	<1
569					<5	<5	
664					<10	<10	
707	450	2,200	40			2,240	50
771/774	<10	400	300	100		800	100
776/777	2,700	1,300	700		<10	2010	100
779		8				8	20
886	<15					0	
991	800				<5	<5	
Total	**6,275**	**9,610**	**2,940**	**105**	**<50**	**12,705**	**301**

Up to an additional 300 kg of plutonium are expected to be generated as residues are processed and assayed with more sensitive instruments. The assessment also included an estimated 40 kg of americium in plutonium residues for consideration of impacts to the workers, public and environment. For a majority of the current AB documents, a solubility class of "Y" was chosen instead of "W". Choosing "Y" results in a lower CEDE. The transportation analysis differs in that it did use the "W" class. The solubility class used in each AB document should be reviewed to ensure that it reflects reality for that facility. This is addressed in Appendix C for incorporated into the next annual update.

The analyses were borrowed or updated from numerous, previous risk assessments or accident analyses. For the Closure Case several assumptions were made. First, that the existing level of protection will continue to be implemented to protect the workers, collocated workers, and public such that future risks would continue at no higher than those presented for the Baseline Case, unless they were specifically evaluated for the Closure Case (e.g., residue stabilization and repackaging activities). Second, future DD&D activities would be sufficiently controlled by appropriate AB documents such that their risks would be less than or no greater than those associated with current Baseline risks. Third, construction of new facilities that are built for storage of plutonium or TRU waste will be per appropriate design criteria for nuclear or radiological facilities.

Chapter 9 presents risk for the two public receptors: a maximally exposed off-site individual (MOI) at the Site boundary and the population within 50 miles of the Site, and for the collocated worker assumed to be located 100 meters downwind of the release.

All of the composite risk accidents except for seismic were performed using median weather instead of 95% weather assumed for development of AB documents. This will pose a problem when attempting to perform USQD screens against the Site SAR – This is further discussed in Section 2.1.2.2 of this Review Report. The risk dominant scenarios fell into seven categories: 1) radiological fires, 2) radiological explosions, 3) radiological spills, 4) nuclear criticalities, 5) aircraft crash, 6) high wind, and 7) earthquakes. The first four categories are also combined into another category called "Operational Accidents." Following is a discussion of the risk dominant scenarios within each of these categories. On-site transportation risks are presented in Chapter 8; however, they were not integrated into the Chapter 9 composite risk estimates. Therefore, a modification of the Chapter 8 data is presented in this section for comparison to median risks from other accidents. In the next annual update, the transportation analysis needs to be included in the composite risk. This is addressed in Appendix C.

2.1.1.1 Composite Operational Accident Risk

For radiological fires, the following dominate the estimate of fire risk:

- A fire on a plutonium building's shipping dock involving plutonium metal or oxide, potentially pyrophoric forms of plutonium, plutonium residues or TRU wastes, or high-americium plutonium residues.
- A fire in a TRU waste or LLW storage building (initiated either by spontaneous combustion of combustibles within a storage package or by an external fire source within the storage area).

For the Baseline Case, the fire risk totals are as follows: 1.1E-3 rem/yr for the MOI, 1.0E-1 rem/yr for the collocated worker, and 2.9E-4 LCF/yr for the 50-mile population. For the Closure Case, the fire risk totals are as follows: 1.2E-3 rem/yr for the MOI, 1.1E-1 rem/yr for the co-located worker, and 2.9E-4LCF/yr for the 50-mile population. The scenarios contributing the most to this risk for both cases are fires involving: 1) plutonium building dock/TRU waste, 2) TRU waste spontaneous drum fire, 3) 1 LLW crate, and 4) 15 LLW crates.

The overall risk from explosions is driven by an acetylene explosion due to maintenance activities. An explosion of this type results in the greatest release from Building 707 with an estimated source term of 3.6 g plutonium for a filter bypass, or 8.6E-4 g plutonium from filtered releases. The overall risk from explosions is 8.2E-5 rem/yr for the MOI, 1.0E-2 rem/yr for the collocated worker, and 1.1E-5 LCF/yr to the 50-mile population.

For radiological spills, the following dominate the estimate of spill risk:

- A spill during manual transfer of plutonium between buildings.
- A spill on a plutonium building shipping dock involving plutonium metal or oxide, potentially pyrophoric forms of plutonium, plutonium residues or TRU wastes, or high-americium plutonium residues.
- A spill in a TRU waste or LLW storage building.

For the Baseline Case, the spill risk totals are as follows: 3.1E-4 rem/yr for the MOI, 3.7E-2 rem/yr for the collocated worker, and 4.1E-5 LCF/yr for the 50-mile population. For the Closure Case, the spill risk totals are as follows: 1.1E-3 rem/yr for the MOI, 1.4E-1 rem/yr for the collocated worker, and 1.5E-4 LCF/yr for the 50-mile population. The scenarios contributing the most to this risk for the Baseline Case are spills involving: 1) Firearms with 1 HEPA stage, 2) Dock - oxide spill, 3) Dock residue drums, 4) Dock – high Americium residues, and 5) Forklift puncture of a TRU container. The scenarios contributing the most to the Closure Case MOI risk are: 1) Dock – oxide spill, 2) Dock – residue drums, and 3) Dock – high-Americium residues. The scenarios contributing the most to the Closure Case collocated work and 50-mile population risk are spills involving the same as for the MOI plus: 1) Fire with 1 HEPA stage, 2) Forklift puncture TRU container, and 3) B664 crane drop of a TRU container. In general, the spill risk for the Closure Case increases by approximately a factor of four due to the increased activities on the docks.

For criticalities, the risk dominant scenarios are shown below in Table 2-5. Since the Highly Enriched Uranyl Nitrate solutions have been removed from Building 886, there is no risk from an 8-hour Uranium solution criticality as shown in the Site SAR Table 9-11, Criticality Risk for Baseline Case. Therefore, the Baseline and Closure Cases

present the same risk. The Site SAR should update this analysis in the next annual update. This is addressed in Appendix C.

Table 2-5. Criticality Risk for Baseline and Closure Cases (Median Weather)

Criticality Scenario	Accident Frequency (per year)	Source Term (fissions)	Maximum Off-Site Individual		Collocated Worker		Population	
			Dose (rem)	Risk (rem/yr)	Dose (rem)	Risk (rem/yr)	Conseq. (LCF)	Risk (LCF/yr)
Water-moderated Pu oxide or metal	5.0E-4	1.0E+19	1.4E-3	7.0E-7	1.5E-1	7.5E-5	6.0E-4	3.0E-7
Single-spike Pu solution	2.0E-4	1.0E+18	2.7E-3	5.4E-7	3.9E-1	7.8E-5	6.0E-5	1.2E-8
8-hr Plutonium solution	2.0E-4	1.0E+19	1.2E-2	2.4E-6	1.7E+0	3.4E-4	6.0E-4	1.2E-7
Criticality Risk Totals				3.6E-6		4.9E-4		4.3E-7

2.1.1.2 Composite Aircraft Risk

The risk from aircraft crashes was analyzed using the evaluation contained in the *Analysis of Off-Site Emergency Planning Zones for the Rocky Flats Plant* (Reference 7). This validated that the maximum consequences of a credible aircraft crash were less than 100 g plutonium respirable release. The risk from an aircraft crash is 6.4E-7 rem/yr to the MOI, 2.2E-7 to the collocated worker, and 3.7E-7 LCF/yr to the 50-mile population. Individual Category 2 nuclear facilities are re-evaluating aircraft crash risks based on the recently-issued DOE-STD-3014-96, *Accident Analysis for Aircraft Crash Into Hazardous Facilities*, and should be incorporated into the next annual update of the Site SAR – this is addressed in Appendix C.

2.1.1.3 Composite Wind Risk

For high winds, Building 776/777 is the only building vulnerable to high winds. A sustained wind speed of 110 mph creates "threshold damage," and a sustained wind speed of 150 mph creates "total damage" which results in extensive damage that renders the structure uninhabitable, requiring demolition or reconstruction. With a source term of 20 g respirable plutonium, the risk is 2.3E-5 rem/yr to the MOI, 2.8E-3 rem/yr for the collocated worker, and 3.1 E-5 LCF/yr to the 50-mile population.

2.1.1.4 Composite Seismic Risk

For seismic, Chapter 9 updates the CID median risk estimates to incorporate the Discovery USQ on seismic inadequacy of Building 707/707A. Results are summarized from the Site SAR Table 9-17 in Table 2-6 for the Peak Closure case by building contribution. The Discovery USQ impact is a 19% increase in the Peak Closure case risk to the MOI (i.e., 0.054 rem/yr seismic and Site composite risk of 0.056 rem/yr) from that previously evaluated in the CID. In order of dominance, Building 707/707A contributes 44% to overall seismic risks, Building 776/777 contributes 29%, Building 771 contributes 23%, and Building 371 contributes 4%, which is graphically protrayed in the Site SAR Figure 9-5. Quantitative risk estimates are also presented for the collocated worker and the 50-mile population but are not summarized in this Review Report because they provide essentially the same insights.

Table 2-6. Site SAR Table 9-17 Seismic Risk Perspectives (Closure Case, Median Weather)

Accident Scenario	Frequency (/yr)	BST (g Pu)	MOI Dose (rem, CEDE)	MOI Risk (rem/yr)	% of Seismic (Figure 9-5)
371	2.9E-5	5.8E+2	6.7E+1	1.9E-03	3.6%
374	1.1E-3	3.0E-2	3.5E-3	3.9E-06	<0.1%
559	2.0E-3	1.4E-1	1.6E-2	3.2E-05	0.1%

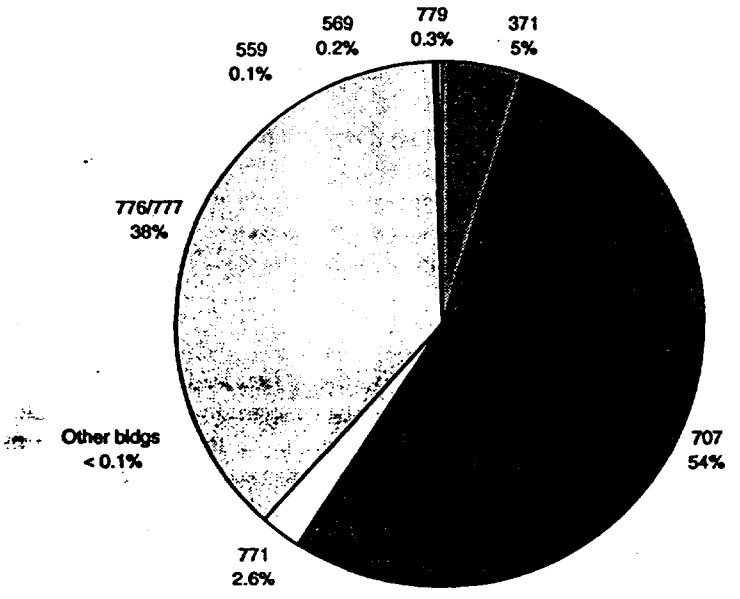
440/569/664	2.0E-3	1.3E-1	1.5E-2	3.0E-05	<0.1%
707A-H (no J&K collapse)	8.3E-4	3.7E+1	4.3E+0	3.6E-03	
707A-H w/ J&K 50% collapse	1.7E-3	9.6E+1	1.1E+1	1.8E-02	
707A-H				2.2E-02	
707J-K	9.4E-5	1.5E+2	1.8E+1	1.7E-03	
707 total				2.4E-02	44%
771/774	1.0E-3	1.1E+1	1.2E+0	1.2E-02	23%
776/777	1.0E-3	1.3E+2	1.5E+1	1.5E-02	29%
779	8.0E-4	2.0E+0	2.3E-1	1.8E-04	0.3%
991	1.0E-3	1.0E-1	1.2E-2	1.2E-05	<0.1%
Site Seismic Total		9.7E+2	1.1E+2	5.4E-02	100%
Other Accidents, NPH, aircraft				2.4E-3	
Site Composite Risk				5.6E-2	

The Closure case median risks as evaluated in the CID represents a peak estimate of annual risk based on the 1997 Draft 2.0 *Ten Year Plan* Reference Case 2 funding profile that would achieve Site closure by the year 2015. This draft *Ten Year Plan* has been finalized in *Accelerating Cleanup: Focus on 2006* (i.e., Closure Plan). The Closure Plan Reference Case 5a funding profile accelerates activities to achieve Site closure by 2010. Several major risk reduction activities have been recently accelerated which result in reducing seismic risk to the public from the Peak Closure case estimate. These include elimination of all SNM and plutonium residues from Buildings 886, 779 and 771. A November 1998 update to the seismic median risk estimates is presented in Table 2-7, which shows a current seismic risk estimate of 0.043 rem/yr and an overall Site composite risk of 0.046 rem/yr. This shows that Site composite risk to the public has slightly increased over the 1994 Baseline case (0.044 rem/yr as shown in Site SAR Table 9-17) due to startup of residue stabilization activities, but are lower than the Peak Closure case (0.056 rem/yr as shown in Table 2-6). Table 2-7 also includes the impact from the recent Discovery USQ on seismic inadequacies of Building 707/707A and consolidation of MAR into Buildings 371 and 776/777. Results show that Building 707/707A currently contributes 54% to overall seismic risks, Building 776/777 contributes 38%, Building 371 contributes 5%, and Building 771 contributes 3%. The building contribution is graphically portrayed in Figure 2-1. As facilities undergo deactivation and removal of SNM inventories, this distribution will continually change and be dominated by plutonium holdup MAR estimates and later will be dominated by TRU waste storage facilities.

Table 2-7. November 1998 Updated Seismic Risk Perspectives (Median Weather)

Accident Scenario	Frequency (/yr)	BST (g Pu)	MOI Dose (rem, CEDE)	MOI Risk (rem/yr)	% of Seismic
371	2.86E-5	6.65E+2	7.61E+1	2.2E-03	5.0%
374	1.11E-3	3.00E-2	3.44E-3	3.8E-06	<0.1%
559	2.00E-3	1.40E-1	1.60E-2	3.2E-05	0.1%
440/569/664	2.00E-3	4.16E-1	4.76E-2	9.5E-05	0.2%
707A-H (no J&K collapse)	8.34E-4	3.70E+1	4.24E+0	3.5E-03	
707A-H w/ J&K 50% collapse	1.67E-3	9.55E+1	1.09E+1	1.8E-02	—
707A-H				2.2E-02	
707J-K	9.43E-5	1.54E+2	1.76E+1	1.7E-03	
707 total				2.3E-02	54%
771/774	1.00E-3	1.00E+1	1.15E+0	1.1E-03	2.6%
776/777	1.00E-3	1.42E+2	1.63E+1	1.6E-02	38%
779	8.00E-4	1.33E+0	1.53E-1	1.2E-04	0.3%
991	1.00E-3	1.00E-1	1.15E-2	1.1E-05	<0.1%
Site Seismic Total		9.7E+2	1.1E+2	4.3E-02	~100%
Other Accidents, NPH, aircraft				2.4E-3	
Site Composite Risk				4.6E-2	

Figure 2-1. November 1998 Updated Seismic Risk Contribution by Building



2.1.1.5 On-Site Transportation Median Risk

The Site SAR Chapter 9 summary of Site composite risk did not include the risks from on-site transportation as evaluated in Chapter 8. For comparison purposes to median risk estimates presented in Chapter 9 from earthquakes, operational accidents, etc., the Chapter 8 transportation median risks are about 5E-5 rem/yr. This is less than 0.1% of the Site composite risk of 0.056 rem/yr to the MOI. On-site transportation risk is further discussed in Section 2.4 and Appendix A. However, for completeness, the next annual update should factor the on-site transportation risk into the overall Site composite risk. This is addressed in Appendix C.

2.1.1.6 DOE Safety Goal Comparison

A comparison to the DOE SEN-35-91 Safety Goals is presented in the Site SAR Section 9.4.3. It is based on the realistic risk assessment approach as presented in Table 2-6, but adjusted for a one mile and 10-mile population from the Site boundary. This evaluation concludes that the Site meets both the prompt fatality risk goal and the LCF risk goal. RFFO agrees with this conclusion, even with the updated composite risk and on-site transportation risk included.
None of the postulated accidents have consequences that could result in a prompt or early fatality to a member of the public as a result of a release of plutonium. This conclusion is consistent with previous assessments for resumption of plutonium operations in the early 1990s and for the DNFSB Recommendation 94-3 Implementation Plan.

The LCF consequence methodology for individual risk to a member of the 10-mile population from the Site is based on the DNFSB Recommendation 94-3 Task 9 risk assessment methodology, but updated for the higher Aged WG plutonium dose conversion factors. The updated realistic risk assessment frequencies of occurrence and source terms presented in Section 9.4.3 were applied to estimate the individual LCF risk. Results indicate that the individual risk is 1.7E-8 LCF/yr, which is approximately 0.9% of the DOE Safety Goal of 2E-6 LCF/yr/individual. This is consistent with previous individual building estimates and shows that the Site composite risks meet the DOE Safety Goals.

The conclusion that the Site risks meet both DOE Safety Goals is not expected to change if a more comprehensive probabilistic risk assessment were performed, instead of the conservatisms associated with relying on a set of bounding accidents. What could change is the comparison of the estimated fraction of the LCF Safety Goal, but this should not significantly reduce the approximately two orders of magnitude difference.

2.1.2 RISK PERSPECTIVES FROM FACILITY AB DOCUMENTS

In addition to the median estimates of composite risk for risk management purposes, RFFO had intended that the Site SAR also integrate the risks as presented in the approved Hazard Category 2 nuclear facility ABs along with the risks as identified in the FSAs and the on-site transportation risk assessment for USQD purposes. However, due to timing, this could not be accomplished and should be completed in the next annual update. This is addressed in Appendix C. At RFFO's direction during review of the Draft Site SAR, a conservative perspective on composite risk was added in Section 9.4.5 to present a summary of seismic risks (since they account for 96% of the Site composite risk per the CID realistic risk estimates) from approved facility AB documents (i.e., BIOs, BFOs, FSARs, USQDs, JCOs, etc.). The following discussion presents that evaluation and also discusses Site-wide USQD considerations.

2.1.2.1 AB Summary of Composite Seismic Risk

The Site SAR Table 9-20 summarizes AB document seismic return periods (i.e., reciprocal of frequency of occurrence) and presents consequences in terms of the AB building source terms and reported radiological doses (or appropriate conversions to 95th percentile CEDE doses to the MOI if necessary since not all approved AB documents used the same dispersion and dose assessment methodology). Due to the worst case dispersion assumption for AB documents, the radiological consequences to the MOI are approximately a factor of 10 higher than the median doses presented in the remainder of Chapter 9 for the purpose of presenting risk management information. There also is a difference in methodologies such as source term calculations and that some AB documents do not evaluate collapse of the structure from credible earthquakes.

Without considering the Building 371/374 Beyond Design Basis Earthquake (BDBE) that could collapse the building (due to an estimated return period of 38,400 years[1]), the Site SAR Table 9-20 shows that there could be a Site total release of 209 g plutonium resulting in 230 rem to the MOI. This estimate does include a 154 g plutonium release and 170 rem to the MOI contribution from a 10,600-year collapse of the seismically-upgraded Building 707A (Modules J and K). This scenario was included in the Building 707 BIO Appendix because it was evaluated for resumption of plutonium operations due the uncertainties in the documentation of the structural upgrade. However, the source term and adjusted MOI dose, are from the CID realistic risk assessment, not the approved Building 707 BIO Appendix. Table 9-20 should have been based on the Building 707 BIO Appendix which ranges from 23 g plutonium for Modules A through H collapse to 110 g plutonium for collapse of both Buildings 707 and 707A. The draft Phase II BIO for Building 707/707A re-evaluates seismic source terms, consequences and risks which should be included in the next annual update of the Site SAR after the BIO is approved.

According to the Site SAR Table 9-20 AB perspective, the next largest contributor to consequences are from Buildings 776/777 and 779, each with a 20 g plutonium source term and 22 rem to the MOI. These consequence estimates are based on the 1987 FSARs because the Building 779 BIO for DD&D does not evaluate seismic events, and the draft Building 776/777 BIO has not yet been approved by RFFO. These estimates may not be representative of the potential consequences (and risks) from current activities in either building. The draft Building 776/777 BIO currently estimates a 16 g Pu source term from seismic collapse that would result in 16 rem to the MOI plus additional dose from a subsequent fire, explosion or criticality (the bounding dose from a seismic event is expected to be higher in the final BIO due to resolution of DOE review comments on treatment of americium and subsequent fires, explosions, and criticalities). After approval of the BIO, the seismic estimates should be included in the next annual update of the Site SAR. See RFFO technical direction in Appendix C.

[1] Since Building 371 was determined to not collapse from a PC-4 10,000-year earthquake, it should not be included in the AB quantitative estimates of consequences and risks. However, its 38,400-year collapse earthquake should be included in realistic estimates of risk to provide proper risk management perspectives.

For Building 771, the BFO seismic risk assessment is based on a less severe seismic event than the structure is able to withstand, but that will fail vital safety systems to mitigate releases (e.g., no HEPA filtration but credit an ambient leakpath factor for a building with doors closed and no major tertiary breaches). Therefore, its estimate of seismic risk is unrealistically low due to not evaluating collapse from a more severe, but credible earthquake. Since Building 771 has substantial holdup (up to 100 kg Pu as shown on Table 2-4), a seismic-collapse estimate based on its measured or estimated holdup should also be included in the next annual update to the Site SAR. See RFFO technical direction in Appendix C.

The Building 559 seismic estimates are also low. A recent Technical Safety Requirement change was approved to increase the building MAR from 2 kg Pu to 7 kg Pu. Therefore, the seismic consequences and risk are approximately a factor of three higher than those presented in Table 9-20. This is currently being addressed in the Building 559 FSAR annual update that is being reviewed by RFFO. The next annual update to the Site SAR should reflect the higher seismic risk estimates. See RFFO technical direction in Appendix C.

The Site SAR Table 9-20 also presents numerical risk estimates by multiplying the MOI dose by the AB-approved estimate of seismic frequency of occurrence. These bounding point estimates are summed to present a Site composite risk of 0.28 rem/yr (excluding the Building 371/374 Beyond DBE) rather than the median risk estimates discussed earlier (i.e., 0.044 rem/yr for the Baseline case, 0.056 rem/yr for the Closure case, or 0.046 rem/yr 1998 update). Contribution by building to the Site seismic risk composite is presented in a pie chart in the Site SAR Figure 9-6 which is reproduced in Figure 2-2. This perspective includes collapse of Building 371 which is incorrect since it has been confirmed to not collapse due to a 10,000-year Performance Category 4 earthquake. Using the AB-approved data, Building 707/707A is the greatest contributor to seismic risk, the same conclusion as from the realistic risk assessment as shown in Table 2-6 and the Site SAR Figure 9-5, but with a larger contribution (i.e., 79% rather than 44% of the Site composite estimates).

Table 2-8 presents a slightly different perspective based on adjusting the Site SAR Table 9-20 for AB-approved consequences and frequencies. Source terms and dose consequences were adjusted as discussed above for Building 707/707A and Building 771 to reflect the BFO-approved bounding estimate (i.e., Table 9-20 is incorrectly based on the BFO nominal MAR and dose, rather than the bounding estimate established by increasing the nominal consequences for all Scenarios of Concern by 50%). No changes were made to the Buildings 776/777 and 779 estimates for this comparison due to the lack of an AB-approved better estimate. The revised estimates show a reduction in the 209 g plutonium source term to 166 g plutonium, resulting in a MOI dose reduction from 230 rem to 170 rem. MOI risk estimates also are reduced from 0.28 rem/yr to 0.19 rem/yr. These revised consequence and risk estimates as shown in Table 2-8 should be used for future USQDs of discovery issues or proposed changes to address cumulative Site impacts (see later discussion in Section 2.1.2.2 on USQD considerations).

Figure 2-2. Site SAR Figure 9-6 AB Seismic Risk Perspective

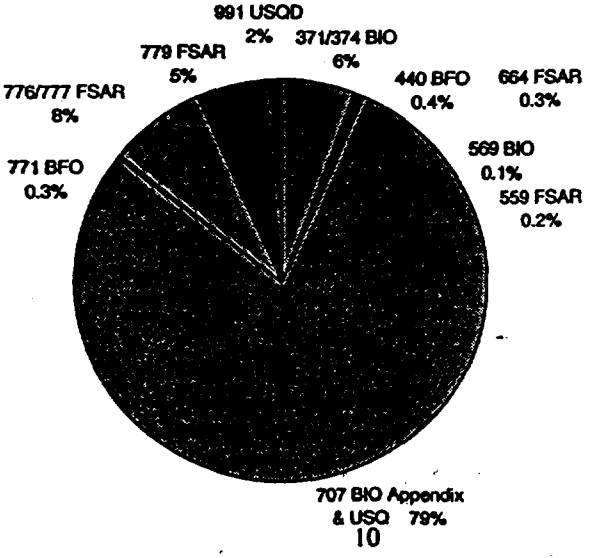
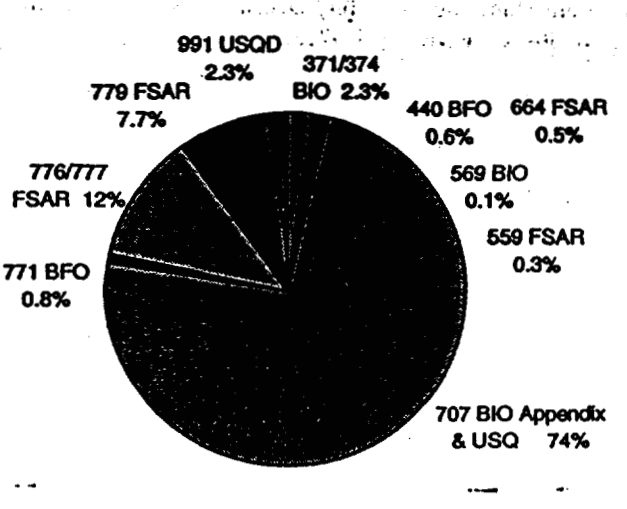


Table 2-8 also shows the contribution by building for the revised calculations. The revised Table 9-20 AB estimates are graphically portrayed in Figure 2-3. Comparing the revised AB estimates to those from the Site SAR (as reproduced in Figure 2-2), Building 707/707A is still the dominant contributor (with 74% rather than 79%). The AB perspective on composite risk to the public is the same as previously mentioned based on the median risk perspective (i.e., risks will be dominated by SNM and residue inventories until facilities undergo deactivation, then by plutonium holdup MAR estimates, and then by TRU waste storage facilities).

Table 2-8. Revised AB Perspectives on Site Seismic Risks (Revised Site SAR Table 9-20 Estimates; 95% Weather)

SEISMIC	Return Period (yrs)	Frequency (/yr)	BST (g Pu)	MOI Dose (rem, CEDE)	MOI Risk (rem/yr) (conservative risk estimate)	Revised Table 9-20 (conservative risk estimate)
371/374 BIO	2000	5.0E-04	7.7	8.6E+00	4.3E-03	2.3%
440 BFO	2000	5.0E-04	1.9	2.1E+00	1.1E-03	0.6%
559 FSAR/TSR	500	2.0E-03	0.2	2.5E-01	5.0E-04	0.3%
569 BIO	833	1.2E-03	0.2	2.0E-01	2.4E-04	0.1%
664 FSAR	Unlikely	1.0E-03	0.8	9.0E-01	9.0E-04	0.5%
707A-H (no J&K collapse)	385@33%	8.3E-04	23	2.3E+01	1.9E-02	
707A-H (w/ J&K 50% collapse)	385@67%	1.7E-03	67	6.7E+01	1.1E-01	
707A-H					1.3E-01	
707A-K collapse	10600	9.4E-05	110	1.1E+02	1.0E-02	
707 total (BIO Appendix & USQ)					1.4E-01	74%
771 BFO	500	2.0E-03	0.7	8.0E-01	1.6E-03	0.8%
774 FSAR	1000	1.0E-03	0.002	2.2E-03	2.2E-06	0.001%
776/777 FSAR	1000	1.0E-03	20	2.2E+01	2.2E-02	12%
779 FSAR	1500	6.7E-04	20	2.2E+01	1.5E-02	7.7%
991 USQD	Unlikely	1.0E-03	4.0	4.4E+00	4.4E-03	2.3%
Site total			166	1.7E+02	1.9E-01	~100%

Figure 2-3. Revised Site SAR Figure 9-6 AB Seismic Risk Perspective



2.1.2.2 Site-Wide USQD Considerations

One goal that RFFO envisioned by having the Site SAR address the cumulative impacts of all facilities and hazards in the Chapter 9 composite risks is that the data could be used for future safety evaluations of proposed changes or discovery issues. The Site SAR falls short of meeting this goal. This data would be useful to provide perspective on overall Site risk impacts or previously accepted probabilities and consequences of bounding accidents for each accident category (e.g., fires, criticalities, etc.). This safety evaluation should be performed to provide a Site-wide perspective for those positive USQs based on the facility AB safety evaluation or for common hazards (e.g., natural phenomena) that could impact multiple facilities and Site composite risks. This is addressed in RFFO technical direction in Appendix B.

As currently structured, the Site SAR Volume II FSAs can be used to perform a USQD against a specific facility or Site support system but not from a site-wide perspective. Seismic risks are discussed above along with RFFO corrections in Table 2-8 for future safety evaluations. Also, transportation risks are now evaluated as discussed in Appendix A which establishes a basis for future on-site transportation USQDs.

However, the aircraft crash risk cannot be adjusted for USQD purposes since it was adopted from previous probabilistic risk assessments of many scenarios, and only the composite risk estimate from numerous frequencies times consequences are included. The Site SAR has not evaluated aircraft risks per the recently issued DOE Standard 3014, which should be performed for a future update (see Appendix C). A partial application of DOE Standard 3014 has been performed for 18 facility *Emergency Preparedness Hazards Assessments* that should be used as a starting point to ensure consistency between the nuclear safety and emergency planning programs and the evaluation completed for the Site SAR. This is addressed in RFFO technical direction in Appendix C.

The composite risk information can also be used to establish a basis for safety evaluations for operational accident categories (i.e., fires, explosions, spills, and criticalities). For example, the recent discovery issue of outside wooden LLW crate storage could have been evaluated against the Site SAR perspective of fire risks presented in its Table 9-8 (which would have resulted in a positive USQ). Adjustments in dispersion methodologies can be made by increasing the Site SAR MOI dose for a specific scenario by a factor of 10 to account for 95th percentile dispersion.[2] The frequency of occurrence in the Site SAR tables can be categorized in the same qualitative frequency bin as currently used for developing new ABs (i.e., Anticipated, Unlikely, and Extremely Unlikely). This results in safety evaluation criteria that should be used to revise the contractor's 3-J69-NSPM-5C-01 USQD procedure as listed in Table 2-9. This is addressed in RFFO technical direction in Appendix B.

Table 2-9. Site-wide Accident Radiological Safety Decision Threshold Criteria (rem, 50-yr CEDE; 95% Weather)

Accident Category	Frequency Category		
	Anticipated (> 1E-2/yr)	Unlikely (1E-2/yr – 1E-4/yr)	Extremely Unlikely (< 1E-4/yr – 1E-6/yr)
Fire	1.7E-1[1]	6.0E-1[2]	1.1E+0[3]
Spill	7.5E-3[4]	1.8E+0[5]	1.8E+0[6]
Explosion	—	4.2E+0[7]	4.2E+0[6]
Criticality	—	1.2E-1[8]	1.2E-1[6]
Natural Phenomena	—	6.7E+1 per building[9], or	1.1E+2 per building[11], or

[2] The Site SAR dose calculations are based on an average 1.9 km distance to the Site boundary. Individual facility distances could increase or decrease the MOI dose by up to approximately 50%, which could be considered in future USQDs, but should not be the basis for declaring an increase in consequences due solely to a shorter actual distance to the Site boundary.

		1.3E+2 Site total[10]	1.7E+2 Site total[12]
On-site Transportation: a) Pu metal, oxide & salt b) Pu residue c) Pu liquid d) TRU & LLW	—	—	a) 3.8E+0[13] b) 8.0E-1[14] c) 3.2E-2[15] d) 2.6E-1[16]

[1]1 LLW crate fire
[2]15 LLW crate fire
[3]High-Am drum dock fire
[4]664 crane drop TRU
[5]Residue drum dock spill
[6]Carryover from higher frequency bin
[7]Oxyacetylene welding explosion
[8]8-hr Pu solution criticality
[9]Building 707/partial 707A collapse
[10]Excludes 707/707A total collapse
[11]Building 707/707A collapse
[12]SER Table 2-8
[13]SER Table A-8, Scenario 8
[14]SER Table A-2, Scenario 8
[15]SER Table A-3, Scenario 7
[16]SER Table A-5, Scenario 8

2.2 PROPANE/NATURAL GAS

The Draft Site SAR modeling used for propane and natural gas was very conservative in that it was based on the TNT method which resulted in a prediction of significant damage from the unconfined vapor cloud explosion that breached Plutonium buildings causing a radiological consequence. After the JBF course on explosion analysis was presented at the Site, RFFO and the contractor agreed that the use of the TNO multi-energy method and the Strehlow method was more realistic. The new calculations concluded that no damage to the plutonium buildings or plutonium releases would be expected. The RFFO performed an independent review of the new calculations and concluded that they were adequate and correct. This peer review is documented in Reference 8.

The risk from propane and natural gas was analyzed as part of the Site SAR Volume II FSA for Fuel Gas Systems and was discussed in Chapter 3 Section 3.3.3 of Volume I. This FSA concludes that propane vapor cloud explosions are only expected to occur following storage tank rupture, spill of the liquid contents on the ground, and, through evaporation, form a vapor cloud which could be flammable. Table 2-10 Potential Vapor Cloud Explosion Effects on Nuclear/Radiological Facilities presents the results of the propane analysis.

Table 2-10. Potential Vapor Cloud Explosion Effects on Nuclear/Radiological Facilities

Storage Tank Location	Nearest Affected Nuclear/Rad Facility	Distance from Explosion to 1 psig Overpressure (ft)	Distance to Nearest Affected Facility (ft)
West wall of B762	707	280	360
West wall of B372A	371	220	330
West wall of B792A	771	280	420
West end of Trailer T760A	707	220	330
South of Trailer T771B	771	75	100*
Next to Trailer T891G	906	<<100	100

* Pressure less than 1 psig may have effect if dock doors open or if transport truck is at dock.

The 1 psig overpressure is taken as the threshold to damage wood frame buildings and provides a conservative value for assessing threshold of damage to Site facilities. While none of the predicted overpressures exceed 1 psi beyond 130 feet and there are no facilities located within the 130 feet (i.e., no impact), several procedural controls were

recommended in Section 3.3.3.2 to prevent the occurrence of postulated explosions or to maintain the assumption in the analysis. Section 3.3.3.2 of the Site SAR lists three controls and an action to phase out and replace propane with natural gas. The corresponding Site Engineered Controls (SEC 7 and 8) only address two of the three actions listed in Section 3.3.3.2. SEC 7 is "Parking in the vicinity of propane tanks shall be controlled." SEC 8 is "Pressure relief valves on propane tanks shall be maintained to ensure proper operation." An SEC to control the ignition sources within 20 feet of the propane tanks must also be implemented. This is addressed in the RFFO technical direction. In addition, RFFO will verify as part of its oversight of the contractor's IVR the progress on phasing out propane and replacement with natural gas (addressed in Appendix D).

The accident analysis results (identified in Volume II) for natural gas identify the Vapor Jet Explosion caused by a ruptured gas line that is attached to a building as one which could cause structural damage to a radiological or nuclear facility. The analysis concludes that an explosion of this type is not expected to threaten the structural integrity of any buildings constructed of masonry or reinforced concrete. However, the Site SAR defers analysis of specific cases associated with individual facilities as an action for each of the facilities. This is further addressed in Section 2.5 of this Review Report in issue #4. In addition, individual AB documents assume that the natural gas lines internal to the facility were purged prior to blanking of the pipeline at the facility boundary. This has never been validated. Upon Site SAR implementation, RFFO will assess the status of these validations. This is addressed in Appendix D of this Review Report.

2.3 BUILDING 881 FSA

The Building 881 cluster contains two facilities which are considered radiological and for which the hazards analysis was performed: Buildings 881 and 887F. The risk dominant accident scenarios are defined as those that result in a Risk Class I and II based upon the estimated scenario frequency and postulated consequences. There are no risk dominant accidents associated with exposure to the public and one risk dominant scenario associated with exposure to the collocated worker. The three accident scenarios analyzed are: explosions, fires and spills. However, since there are no initiators for an explosion, this accident type was eliminated. The following are the hazard analysis summaries for fires and spills.

Table 2-11. Building 881 Hazard Analysis Summaries (Fires and Spills)

			MOI		Collocated Worker	
Scenario	Frequency	MAR	Conseq (rem)	Risk (rem/yr)	Conseq (rem)	Risk (rem/yr)
Small fire, non-lofted, 10 minute duration release	Extremely unlikely	0.45 g (3 drums @ 0.15 g/drum)	Low 3.9E-4 Low 4.1E-5	IV 4.0E-8 IV 4.1E-9	Low 3.6E-2 Low 4.5E-3	IV 3.6E-6 IV 4.5E-7
Small fire, non-lofted, 10-minute duration release	Extremely unlikely	0.63 g (1 crate @ 0.63 g/crate)	Low 5.5E-3 Low 5.7E-4	IV 5.5E-7 IV 5.7E-8	Moderate 5.0E-1 Low 6.3E-2	III 5.0E-5 IV 6.3E-6
Large fire, non-lofted, 30-minute duration release	Extremely unlikely	11 g (10 drums @ 0.15 g/drum + 15 crates @ 0.63 g/crate)	Low 6.7E-2 Low 7.0E-3	IV 6.7E-6 IV 7.0E-7	Moderate 6.1E+0 Moderate 7.7E-1	III 3.9E+0 III 7.7E-5
Spill of contents of 1 crate, 10-minute duration release	Anticipated	0.63 g (1 crate @ 0.63 g/crate)	Low 1.1E-5 Low 1.1E-6	III 1.1E-5 III 1.1E-6	Low 1.0E-3 1.3E-4	III 1.0E-3 III 1.3E-4

Spill of 10% of contents of 4 drums, 10-minute duration release	Anticipated	0.60 g (4 drums @ 0.15 g/drum)	Low 1.1E-5 Low 1.1E-6	III 1.0E-5 III 1.1E-6	Low 9.6E-4 Low 1.2E-4	III 9.6E-4 III 1.2E-4
Earthquake, multiple packages, 10-minute duration release	Unlikely	326.5 g (30 drums @ 0.15 g/drum + 15 crates @ 0.63 g/crate + 312.5 g from ductwork)	Low 5.53E-2 Low 5.7E-3	III 5.5E-4 III 5.7E-5	Moderate 5.0E+0 Moderate 6.2E-1	II 5.0E-2 II 6.2E-3

Section 3.3.2 of the Building 881 FSA defines the assumptions used in the development of the postulated accident scenarios. The assumptions are similar to those used in other recently approved AB documents. The airborne release fraction used for waste in wooden crates is 5.0E-3. The Site has gone to 5.0E-4 for waste in wooden crates. Therefore, this analysis is overly conservative regarding wooden waste crate accidents. In addition, the method used to compute the MAR for the earthquake accident was overly conservative due to lack of measurement data. This presents an unrealistic risk for Building 881 indicating that it is actually higher than Building 774 and the same as Building 559 which are both Hazard Category 2 facilities. Therefore, it should be revised upon completion of characterization just prior to D&D work commencing in Building 881.

Specifically credited in these analyses are:

- Extremely low transitory combustible loading
- Specific requirements regarding storage and material handling of compressed gas cylinders in procedure 1-62300-HSP-11.01
- Automatic fire suppression
- Response of the Site Fire and Emergency Services Department.

These aspects are captured as controls in the Building 881 FSA and are further discussed later in this section and in Section 5 of this Review Report.

2.4 ON-SITE TRANSPORATION

To support startup of the salt residue stabilization program, an on-site transportation risk assessment was prepared and documented in a Nuclear Safety Technical Report and accepted by RFFO. This assessment evaluated transportation risks associated with plutonium and high americium concentrations in salt residues, and identified appropriate controls to reduce the frequency, consequences, and risk of accidents. A follow-on risk assessment of all other radioactive material on-site transportation was prepared and documented in another Nuclear Safety Technical Report. However, due to timing, that second assessment was not reviewed by RFFO because it was revised for the Site SAR and now appears in Chapter 8. Chapter 8 does not include the risk results and required controls of the first assessment on salt transportation but should have. The salt transportation analysis needs to be included in Chapter 8. This is addressed in Appendix D. Approval of the Site SAR includes approval of the analyses performed on transportation for all radioactive material movements with vehicles.

The Site SAR Chapter 8 assessment includes accident analysis of on-site transfers of radioactive materials including Category I and II SNM, residues other than high-americium salts, TRU wastes, and LLW (including mixed TRU and LLW). The Site SAR does evaluate on-site transportation of hazardous chemicals, flammable or combustible fuels and some offsite events to assess on-site impacts. The bases for approval for on-site transportation is covered in Appendix A of this Review Report.

The current document that authorizes transportation of hazardous and radioactive materials across the Site is the Kaiser-Hill *Site Transportation Manual Series* (1-T91-Traffic-100, 101, 110, 112, 115, 120, 121, and 401). Previous RFFO approval of the Transportation Manual focused on meeting Department of Transportation (DOT) requirements (or their equivalencies for on-site conditions) and security aspects of the Manual, not on the nuclear safety risks and controls to prevent or mitigate accidents. Appendix A contains a discussion of this risk assessment

and controls and RFFO's bases for approval. The controls are required to be formally incorporated into the Site's transportation or material handling procedures as directed in Appendix D. The RFFO direction also includes comments to be incorporated into an annual update of the Site SAR as discussed in Appendix C.

Except as identified in Appendices B, C and D, RFFO concurs with the Chapter 8 risk assessment, identified controls (including the ones identified in Table A-6 of Appendix A), and conclusions for on-site transfers of SNM, residues (solid and liquid), TRU, LLW, hazardous chemicals, and fuels. This Site SAR risk assessment and the previous risk assessment for salt transportation provide an AB which will be used for future USQDs of proposed changes or discovery issues. Together, the two risk assessments establish a defensible AB where none existed previously.

2.5 MISCELLANEOUS RISK DISCUSSION

While further reduction in risk will occur once the plutonium buildings are deactivated and ultimately decommissioned, and the TRU and LLW is shipped off-site, there will be a noticeable increase in risk during these activities. This results from the occurrence of a significant amount of work which could result in fires and spills. There is also a significant increase in work activities occurring concurrently in the same facility. In the past, the Site has relied on a mitigative, defense-in-depth strategy. It has more recently transitioned to a preventive strategy with often only one level of control. Key in this new strategy is a heavy reliance on Administrative Controls and more specifically, on the robustness of the safety infrastructure via the Safety Management Programs (SMPs). Individual facilities have identified key aspects of the SMPs as essential in preventing and mitigating identified hazards. The Site SAR provides the base SMP descriptions which are to be used Site-wide. Since the SMP descriptions vary among the individual AB documents and may be inconsistent with the Site SAR descriptions, whichever is the more restrictive is the one which is to be enforced. This is addressed in technical direction. Eventually, all of these inconsistencies will be resolved through annual updates of the individual AB documents.

Two of the most significant toxic chemicals analyzed in the Site SAR (chlorine and sulfur dioxide gases) have recently been removed from the Site. While these hazards are analyzed in the Site SAR, they will be deleted from the Site SAR in the next update.

The analyses of the hazards associated with the systems and activities which affect the Site, or are located Site-wide adequately determine the hazards and their potential consequences. This includes analyses of the natural gas and propane systems, steam and condensate production and distribution. Volume II analyzes these systems via the FSAs. While these systems present standard industrial hazards, their importance in safety analysis space is primarily due to the fact that they provide a vital service to a nuclear facility and support technical safety requirements, operational safety requirements or operational controls identified in facility AB documents. Therefore, the controls on these systems must address the key attributes which ensure that the vital service is maintained and that the affected facilities are notified when a control cannot be met. Also, the natural gas and propane systems could cause an initiator of an accident that is analyzed for impacts and identification of controls.

2.6 MAJOR ISSUES IDENTIFIED DURING THE REVIEW

The Review Team identified a number of significant issues during the review process. The issues are detailed below with their corresponding resolution.

1. There are a number of Site-wide Justifications for Continued Operations (JCOs) which contribute to the Site-wide risk and have not been incorporated into the Site SAR. These include the outdoor storage of LLW/LLMW wooden crates, pressure safety, Criticality Alarm System, and Americium.

   The contractor has submitted a Site-wide JCO for the outdoor storage of LLW/LLMW wooden crates as a result of the 779 Closure BIO cross-table review. The contractor implemented interim controls on May 28, 1998, to prevent and mitigate the newly identified hazards while the JCO was being developed. The JCO identifies essentially the same controls and commits to the timely incorporation of these controls into individual AB documents. While the actions defined in the JCO do not bring the Site into compliance, the actions provide sufficient compensation to allow the RFFO to accept the interim risk. However, when the contractor completes transition to the use of metal waste boxes for LLW/LLMW, this risk is eliminated. The Site SAR is to be

updated to incorporate this JCO. In the interim, the JCO is immediately incorporated as part of the Site SAR upon issuance of this Review Report. This is addressed in technical direction.

The lack of a compliant, Site-wide pressure safety program was identified several years ago, but was not fully scoped until earlier this year. The contractor has implemented a Site-wide, RFFO-approved JCO to address this increased risk and includes a plan to restore compliance. In addition, the contractor has requested an exemption from some of the pressure safety requirements which is being reviewed by DOE for approval.

Due to the age of many authorization basis documents, some areas of the Site were not bound to the recommendations of the ANSI standard for criticality alarm system functional requirements. When implementing the controls for the 12 rad area (i.e., the area where estimated dose received in the event of a criticality could possibly exceed 12 rad), there were some deficiencies in alarm annunciation within the selected area (within 100 ft of the facility, except 50 feet for Building 707). A JCO was submitted and approved to address the lack of commitment to the ANSI standard and to put in place interim controls for the 12 rad area due to the deficiencies in alarm annunciation. The Site SAR is to be updated to incorporate this JCO. In the interim, the JCO is immediately incorporated as part of the Site SAR upon issuance of this Review Report. This is addressed in technical direction.

In early 1997, the contractor declared a potential Discovery USQ on americium (Am) concentrations in plutonium residues that were not previously accounted for in the building ABs. Older facility accident analyses assumed weapons grade (WG) Pu with approximately 0.02% Am fraction, while new ones assumed Aged WG Pu with a maximum Am ingrowth of 0.3%. Newer ABs also specifically evaluated high-Am residues to account for Am inventories from previous production activities that separated Am-241 from WG Pu. Early estimates of Site total Am inventory was about 40 kg Am (which were used as the basis for the seismic risk assessment presented in the Site SAR), but the USQD refined this estimate to approximately 31 kg Am. Americium 241 has a much higher dose conversion factor (DCF) than WG Pu, so postulated accidents involving Aged WG Pu or high-Am residues have a higher radiological consequence than similar accidents involving WG Pu. The subsequent USQD concluded that this discovery issue was a positive USQ for some of the nuclear facilities, but not others. RFFO did not concur with all of the contractor's determinations, and concluded that it was a positive USQ for Buildings 371, 569, 771, 776/777, 991, and Site transportation and accepted the associated higher risk. No JCOs were required due to no compensatory measures deemed necessary. This Discovery USQ is being resolved through development of new AB documents for these facilities and nuclear activities (e.g., new ABs have already been approved and implemented for Buildings 371, 569, and 771).

2. The last two phases of RFFO comments on the Site SAR noted that there was no definition of functionality for the operational controls. Therefore, the parameters to be surveilled were not specifically identified. However, the column "Surveillance Requirement" included wording such as "will be conducted in accordance with contractor procedures." Numerous discussions with the contractor indicated that inclusion of functionality parameters would result in a significant delay in the issuance of the Site SAR and would not result in a corresponding benefit to the Site SAR. RFFO has agreed that the functionality does not need to be defined in the SAR, but must be defined in the surveillance procedures, and RFFO will assess as part of the IVR oversight the listing of procedures which support the Operational Control surveillances to ensure that the functionality is defined. This is covered in Appendix D, Issues to be Addressed upon Site SAR Implementation.

3. Over the past several months, there has been significant discussion regarding how the SMP descriptions in the Site SAR will interface with the descriptions contained in the individual AB documents. At one point, it was stated that the individual AB documents would reference the Site SAR descriptions and only include the key attributes for that facility. The current plan is to eventually maintain consistent descriptions. In the meantime, whichever is the most restrictive will be the description that is enforced.

4. RFFO commented on the Draft SAR natural gas distribution line analysis and questioned the lack of analysis for lines leading up to a facility. K-H dispositioned this comment by creating an action for the individual facilities to analyze this condition. Section 4.5.3 (Hazards Assessment) states "all facilities with attached natural gas distribution lines should evaluate the interface between the wall and its attached distribution lines based upon specific facility structural information." However, the Site SAR also makes the comment that the damage to

concrete and masonry walls would be negligible based on the jet explosion analysis. K-H could not identify progress by the facilities in performing this analysis. In addition, there has been no validation that the natural gas lines internal to a facility have been purged prior to blanking at the facility boundary. These items are addressed in Appendix D.

5. The CID and Site SAR composite risk (Chapter 9) screens lightning from being an external event by stating: "lightning protection is considered in facility design . . . and is assumed to be adequately maintained to prevent potential roof fires." However, the Site SAR also states in Section 5.6 (Lightning): "Lightning protection systems for the major buildings have fallen into a state of disrepair and cannot be relied on to provide the needed protection." It further states "credit can only be taken for the LPS [Lightning Protection System] if it can be demonstrated that the LPS for that facility has been inspected recently and is operating as designed." This inconsistency must be resolved. This is addressed in Appendix D.

6. While the tracking and trending of individual noncompliances is typically an implementation issue, it was not evident that the contractor has a clear vision on how noncompliances with the credited controls identified in the Site SAR would be tracked and trended, if at all. The RFFO is directing that a process similar to that directed to be used for the LLW/LLMW wooden waste crate JCO be used. This will be assessed as part of the RFFO oversight of the IVR as stated in Appendix D of this Review Report.

7. Another significant result of the Site SAR being approved and implemented is that it replaces the MAL. The actual mechanism and timing will be determined with the approval of the Site SAR Authorization Agreement. However, the RFFO technical direction includes text to be added to the Site SAR which explicitly states that the hazards and analysis presented in the Site SAR bound the non-hazardous baseline activities contained in the MAL which are not explicitly analyzed in the SAR. Therefore, upon phased implementation of the various Site SAR sections, the MAL AA will be superceded by the Site SAR AA.

The above discussion is a summary of the major issues raised by the Review Team during the course of the review of the Site SAR. These issues along with other issues are discussed in greater detail in Section 5.0 of this Review Report.

2.7 SITE SAR CREDITED CONTROLS

Table 2-12 presents the credited controls in the Site SAR. The SECs ensure continued system support to facilities. They are designed to capture systems inherently credited in facility AB documents. Compliance with the SEC ensures the Site support for these AB documents remains valid. The SECs are similar to an LCO control in that it focuses on the function and operability of system or component to remain in compliance. The SMCs provide additional requirements for department, activities, or devices associated with 1) safe transportation of hazardous materials, 2) mitigation of consequences in the event of an accident and 3) maintenance of devices for worker safety. The SMCs are programmatic in nature and are comparable to programmatic ACs in facility AB documents. The contractor has yet to determine how noncompliances with these controls will be tracked and trended as well as what remedial actions will be implemented. This is addressed in Appendix D. In addition, the contractor should address prior to implementation, the redundancy of the Site electric power if the Site were to lose one of its power feeds. For SEC 6, Nitrogen Supply, remedial actions similar to those identified for SEC 1 should be included. These issues are addressed in Appendix D.

Table 2-12. Site SAR Credited Controls

System/Service	Control
Fire Protection Water System	SEC 1. Ensure the fire protection water supply system is capable of supplying firewater to facility fire suppression systems and fire hydrants. a) Adequate firewater supply is available. b) Distribution system allows flow of firewater. c) B928 fire pumps are available.

	SMC 1. Maintain a trained, qualified, and adequately staffed Fire and Emergency Services Department at RFETS 24 hours per day.
Site Electrical Power	SEC 2. Assure the electrical power supply equipment provides 115 kV power to the Site and 13.8 kV power to individual buildings. SEC 3. Ensure the substations are capable of transferring the electrical load from the power supply equipment.
Site Alarm System	SEC 4. Ensure the Site alarm system is capable of transmitting and receiving alarms throughout the Site.
Site Steam System	SEC 5. Assure the Site steam supply is capable of providing steam to facilities when needed.
Nitrogen Supply	SEC 6. Ensure nitrogen can be supplied to facilities when needed.
Propane and Natural Gas Systems	SEC 7. Parking in the vicinity of propane tanks shall be controlled. SEC 8. Pressure relief valves on propane tanks shall be maintained to ensure proper operation.
Emergency Operations Center	SEC 9. Ensure the Emergency Operations Center (EOC) is prepared for emergency response and capable of being occupied upon demand.
Pressure Relief Devices	SMC 2. Maintain a testing and surveillance program for testing and maintenance of pressure relief devices.
Emergency Response Organization	SMC 3. Maintain trained and qualified personnel to staff the EOC in the event of an emergency.
Transportation	See Appendix A, Table A-6.
Building 881 and 881F	1. Transitory combustible loading shall be controlled. 2. Storage and material handling of compressed gas cylinders shall comply with procedure, 1-62300-HSP-11.01. 3. The automatic fire suppression capability shall be maintained. 4. Fire alarm transmittal capability to the Fire Department shall be maintained. In addition, the following inventory administrative controls apply to both of these buildings. 1. The facility inventory of radioactive materials shall not exceed the lower threshold quantities listed in DOE-STD-1027-92 for nuclear Hazard Category 2. 2. The facility inventory of hazardous chemicals shall not exceed the TQs in 40 CFR 68 or 29 CFR1910.119, TPQs in 40 CFR 355, or the EPST developed by RFETS Emergency Response.

3.0 REVIEW PROCESS

The Site facilities and activities are characterized using the following:

- nuclear Hazard Category 2 and 3 facilities as defined in DOE Order 5480.23 and DOE-STD-1027-92,
- radiological facilities as defined in DOE-EM-STD-5502-94, and
- non-nuclear low and moderate facilities as defined in DOE Order 5481.1B and DOE-EM-STD-5502-94.

These documents do not address categorization of common support systems and facilities relied upon by nuclear Hazard Category 2 and 3 facilities.

Based on the fact that the RFFO has been delegated approval authority for SARs for Hazard Category 2 and 3 nuclear facilities (Reference 9) and there are no facilities classified as higher than Category 3 covered by the Site SAR, the RFFO has interpreted this delegated approval authority to extend to the Site SAR. Based on this interpretation, the RFFO has approval authority for the Site SAR Volume I and the Building 881 FSA in Volume II.

The Site SAR has had a lengthy development process which in essence extends back to 1981 when the Interim Safety Analysis Report was prepared for the Site. It gave a broad overview of the Site, including a brief description of all buildings and structures present on the Site in 1981. It also addressed, in general, the common support systems and facilities. No accident analysis was developed for any facility in the Interim SAR. It has remained in draft form and has never been approved by DOE.

RFFO has held several meetings with K-H to discuss methodology, resolve comments and understand the overall philosophy of how the Site SAR will be used. The Review Team members conducted independent technical reviews of the Site SAR, providing the Team Leader with formal written comments. The comments were then reviewed for consistency and provided to the contractor. A substantial number of comments were generated during this phase of the RFFO review. This led to a cross table review with RFFO in December 1996. Comments were tracked to closure. A file of RFFO comments, comment resolutions and comment closure validation documentation was maintained by the Review Team Leader at that time. The Site SAR was resubmitted for final review and approval on April 14, 1997. The RFFO transmitted additional comments to K-H in December 1997 which led to the April 29, 1998 submittal of Volume I and the June 24, 1998, submittal of Volumes I and II completing the incorporation of the December 1997 comments. A few issues were not resolved in the June 24, 1998, submittal of Volumes I and II of the Site SAR. The significant issues are discussed in Section 2.0 of this Review Report with the remaining issues addressed in the RFFO technical direction. The Review Team felt that due to the lengthy review and comment cycle which the Site SAR has sustained it would be better to require revisions in the next Site SAR update versus another revision prior to approval.

In conjunction with the review, the Review Team also reviewed the supporting documentation provided by the contractor. This included the supporting calculations for transportation: CALC-RFP-98.0660-MAN, *Site SAR Transportation Evaluation: Nonradiological* and CALC-RFP-98.0717-KKK, *Site SAR Transportation Analysis for Fuels and Off-site Events*. In September 1996, Draft C was submitted to RFFO for review and comment —

The most recent RFFO review team consisted of four core team members. A brief biography of each Review Team member is included in Appendix E. The Team Leader originally selected for the Review Team left employment with the RFFO in April 1998. Since he played a significant role in the review process, his biography is also included.

4.0 DESCRIPTION OF THE SITE AND FACILITIES COVERED IN THE SCOPE OF THE SITE SAR

The Site is located in central Colorado, approximately 16 miles northwest of downtown Denver and 10 miles south-southwest of Boulder. The area in the immediate vicinity of the Site is a mixture of agriculture, open space, light

industry, and low density residential housing. The Site consists of approximately 6,265 acres, most of which is a buffer zone around the central industrial area.

The industrial area contains the majority of the facilities and operations with identified and numbered facilities, including the major buildings, appurtenances to major buildings, office trailers, designated pads and storage areas, tank farms, and other features such as roadways and fencing. In addition, there are numerous storage areas, some of which are numerically designated. The various structures are occupied, for the most part, and active with respect to current missions. Within the industrial area is the Protected Area (PA) which is surrounded by an extensive security system. All plutonium handling and storage facilities (with the exception of waste storage) are within the PA.

Activities involving nuclear materials outside the PA are limited to storage and handling of contaminated wastes, activities involving depleted uranium, and environmental restoration. Most Site facilities are in the process of removing hazardous materials and chemicals that are no longer needed to support the operations or processes within the facility. Environmental restoration activities are concentrating on the remediation of contaminated soils. Waste management activities continue and include treatment, storage, shipment, and minimization of TRU waste, TRU mixed-waste, LLW, LLMW, hazardous waste, mixed residues, sanitary, solid and medical waste.

The buffer zone, which surrounds the Industrial Area, is a protected environmental "preserve" for plant and animal life providing refuge for a large number of bird and mammal species, some of which are endangered.

Table 4-1. Hazard Classification of Facilities at the Site

Facility	Facility Description	Basis for Classification (See Note 1)
Nuclear Hazard Category 2 Facilities		
Building 371	Storage and Processing of Plutonium Building	Radioactive material inventory present in greater quantities than the Category 2 threshold.
Building 374	Liquid Waste Treatment	Potential for radioactive material inventory to be present in quantities greater than the Category 2 threshold.
Building 440	Waste Storage/Shipping and TRU Repackaging Facility	Radioactive material inventory present in greater quantities than the Category 2 threshold.
Building 559	Plutonium Analytical Laboratory	Maximum radioactive material inventory allowed is greater than the Category 2 threshold.
Building 569	Drum and Crate Counter Facility	Radioactive material inventory present in greater quantities than the Category 2 threshold.
Building 664	Waste Storage and Shipping	Radioactive material inventory present in greater quantities than the Category 2 threshold.
Building 707	Plutonium Manufacturing	Radioactive material inventory present in greater quantities than the Category 2 threshold.
Building 771	Plutonium Recovery Facility	Radioactive material inventory present in greater quantities than the Category 2 threshold.
Building 776/777	Manufacturing Buildings	Radioactive material inventory present in greater quantities than the Category 2 threshold.
Building 779	Plutonium Development Building	Although most Radioactive material inventory has been removed from the facility, holdup is above Category 2

		threshold quantities.
Building 886	Criticality Laboratory	Although most fissile material has been removed from the facility, holdup is above the Category 2 threshold quantity.
Building 991	Product Warehouse	Fissile material present in quantities greater than the Category 2 threshold.
Nuclear Hazard Category 3 Facilities		
750 Pad	Storage Pad for Pondcrete and Saltcrete	Radioactive material inventory present in quantities greater than the Category 3 threshold and less than the Category 2 threshold.
Building 881 and 881F	Manufacturing and General Support and associated filter plenum	Conservatively classified based on the unknown radiological activity in ductwork and an abandoned scrubber.
904 Pad	Storage Pad for Pondcrete and Saltcrete	Radioactive material inventory present in quantities greater than the Category 3 threshold and less than the Category 2 threshold.
Building 906	Centralized Waste Storage	Radioactive material inventory present in quantities greater than the Category 3 threshold and less than the Category 2 threshold.
Radiological Facilities		
Building 126	Source Storage Building	Certification of the sources cannot be documented and in combination exceed the RQ of 40 CFR 302.
Tanks 231A and B	Process Waste Collection Tanks Included in the Process Waste Collection and Transfer FSA	Based on the volume of each tank, the inventory of fissile material is greater than the 40 CFR 302 RQ and less than the nuclear Hazard Category 3 limit.
Building 444 Cluster	Depleted Uranium Operations Includes Buildings 444, 447, 448, with filter plenums 450, 451, and 455.	Inventory and non-dispersible form of depleted uranium. Filter plenums integral with the facilities are given the same classification. See Note 2.
Building 447	Included in Building 444 Cluster	
Building 448	Included in Building 444 Cluster	
Building 666	Toxic Substance Control Act (TSCA) Waste Storage	Inventory limits are placed on the facility to limit the amount of Pu-239 to less than 8.4 grams.
Building 790	Radiation Calibration Laboratory	Form of materials and radiation levels in facility.
Building 883	Uranium Rolling and Forming Operations (includes filter plenum 879)	Inventory and non-dispersible form of depleted uranium. See Note 2.
Building 886D	Modular Analytical Laboratory	Analyzes radioactive samples.
Building 887	Process Waste Collection and Transfer	Permitted to receive mixed waste streams.
Building 903A&B	Main Decontamination Facility and support Facility	Conservatively classified based on potential to have contaminated materials.
Building 966	Protected Area Decontamination Facility	Conservatively classified based on potential to have contaminated materials.
RCRA Storage Unit	See Note 3 for list of units.	Number of containers which could be released in a credible scenario is less than the total inventory.

Non-Nuclear Moderate Hazard Facilities		
Building 124	Water Treatment Plant	Inventory of chlorine (600lb) greater than the 100lb TPQ.
Building 552	Industrial Gas Storage	Maximum inventory of chlorine and sulfur dioxide exceeds the TPQs.
P750	Propane Tank Farm	Inventory of propane (60,000 lb) exceeds the 10,000 lb TQ.
Building 891	Consolidated Water Treatment Facility	Inventory of acids in excess of TPQs.
P904	Propane Tank Farm	Inventory of propane (60,000 lb) exceeds the 10,000 lb TQ.
Non-Nuclear Low Hazard Facilities		
Building 125	Standards Laboratory	Mercury inventory is greater than the RQ.
Building 443	Heating Plant	Maximum quantity of sodium hydroxide can equal RQ.
Building 462	Cooling Tower	Quantity of calcium hypochlorite exceeds the RQ.
Building 551	General Supplies Warehouse	Epoxy paints and thinners contain hazardous constituents which can exceed the RQs.
Building 865 and filter plenum 868	Material & Process Development Laboratory – Depleted uraniuim	Beryllium contamination in excess of RQ.
Building 928	Fire Water Pump House	Calcium hypochlorite exceeds RQ.

Notes:

1. Facility classifications are based on the quantities of hazardous materials. DOE-STD-1027-92 is used for the hazard category classification for nuclear facilities. Facilities are classified as radiological if the quantity of radioactive material is less than the Hazard Category 3 threshold from DOE-STD-1027-92, but greater than the reportable quantity (RQ) in 40 CFR 302. Facilities are considered as non-nuclear if their inventory of radioactive materials is less than the 40 CFR 302 RQ. Non-nuclear moderate hazard facilities have inventories of chemicals which exceed threshold planning quantities (TPQs) in 40 CFR 355, or threshold quantities (TQs) in 40 CFR 68 or 29 CFR 1910.119. Low hazard facilities have chemicals in quantities greater than the RQ in 40 CFR 302.
2. The methodology in the draft EM Facility Hazard Categorization Standard was used to determine the classification based on the form and dispersibility of the material.
3. The following RCRA units are included in the RCRA Unit FSA:
   - Unit 1
   - Unit 10
   - Unit 13 (B884, Low-Level Waste Warehouse)
   - Unit 15A (on 904 Pad)
   - Unit 18.03 (Area west of B551)
   - Unit 18.04 (B892)
   - Unit 21 (B788)
   - Unit 24 (B964, Low-Level Hazardous Waste Storage)
   - Mobile Assay System

Table 4-2 identifies the facilities and systems contained in Volume II for which an FSA was performed. Since all but Building 881/881F fall below the threshold for RFFO approval, only that FSA and that for Natural Gas Systems were reviewed. The remaining FSAs were reviewed for information only. RFFO has only performed a cursory review of the contractor's hazard categorization but will complete a detailed review prior to the contractor's implementation of the Site SAR.

Table 4-2. FSAs Contained in Volume II of the Site SAR

FSA Title	Description
Building 125	Standards Laboratory
Building 126	Source Storage Building
Building 444 Complex	Includes 444, 447, 448 with filter plenums 447 and 448
Building 462	Cooling Tower for Buildings 440 and 460
Building 551	General Supply Warehouse
Building 666	Toxic Substance Control Act (TSCA) Storage
Building 790	Radiation Calibration Laboratory
Building 881	Manufacturing and General Support (Includes Bldg 885 & 887)
Building 883	Uranium Rolling and Forming Operations
Building 865	Material & Process Development Laboratory
Buildings 891, T900A&B	Consolidated Water Treatment Facilities
Facilities 903A/903B &966	Decontamination Facilities (Main and Protected Area)
RCRA Storage Units	Unit 1 Unit 10 Unit 13 (Bldg 884, Low-Level Waste Warehouse) Unit 15A (on 904 Pad) Unit 18.03 (Area west of Bldg 551) Unit 18.04 (Bldg 892) Unit 21 (Bldg 788) Unit 24 (Bldg 964, Low-Level Hazardous Waste Storage)
Fuel Gas Systems	Includes the natural gas distribution and propane tanks
Industrial Gas Supply & Storage	Nitrogen Plant (Building 223) and Industrial Gas Storage (Building 552)
Steam and Condensate Systems	Central Steam Plant (Building 443), condensate storage tank (240), pressure reducing station (Building 710), and distribution system
Domestic Water System	Building 124, Water Treatment Facility, associated facilities 129, 206, 216, 928, and tanks 215A, 215B, and 215C
Sanitary Sewer System	Building 995 and associated facilities 208, 228A&B, 775, 887, 971, 972, 973, 974, 975, T974A, 988, 990, and 990A
Process Waste Transfer System	Building 231, storage tanks 231A&B, valve vaults, and Building 428
Environmental Restoration Projects	Includes 903 Pad
Industrial Facilities	All facilities not included in other FSAs, FSARs, BIOs, or BFOs

The current mission at the Site is to provide safe storage and management of wastes and special nuclear material with the goal of reducing existing hazards and decommissioning existing facilities. These activities include the consolidation and stabilization of nuclear materials, removal of hazardous materials, decontamination, decommissioning, and environmental restoration. The Site SAR supports these activities by:

- providing a hazard assessment for Site facilities /systems/activities that have not been previously documented,
- providing a cost effective means to document and control remaining facility hazards following risk reduction activities, and
- identifying the safety management programs and other administrative controls (e.g., inventory controls) needed to assure the continued safe operation of specific facilities.

5.0 APPROVAL BASES

Upon approval and full implementation, the Site SAR will supersede the Interim SAR and the MAL. The Site SAR will be placed on the Authorization Basis Document List and will apply to all facilities/areas Site-wide. With phased implementation of the Site SAR, there will be a phased cancellation of the MAL and its corresponding Authorization Agreement.

The Operational Controls in the Site SAR are all new controls since there were no controls contained in the Interim SAR. In addition, the JCOs pertaining to pressure safety and outdoor storage of LLW wooden crates will remain applicable Site-wide until incorporated into the Site SAR and individual AB documents. Since the Site SAR does not meet the formality, depth of analysis or level of detail required of a DOE Order 5480.23 SAR, the DOE -STD-1104-96 (Reference 4) was modified slightly to more accurately assess the adequacy of the Site SAR while meeting the intent of the SAR review criteria.

5.1 ADEQUACY OF BASE INFORMATION

The DOE-STD-1104-96 indicates:

> "Base information . . . encompasses elements of SAR preparation, completeness, and general content. Base information is not reviewed for adequacy in and of itself but for sufficiency to allow assessment of the other approval bases that rely on this information."

Base information found in the Site SAR consists of the technical information contained in the Executive Summary, Introduction (Chapter 1), Site Description and Characteristics (Chapter 2), Site Configuration, Support Systems and Utilities (Chapter 3), and the Section 2, Facility Description and Activity Characterization for the Building 881 FSA (Volume II). The following seven criteria were utilized in assessing the adequacy of the base information contained in the Site SAR:

1) The Site mission and scope of operations for which safety basis approval is being sought are clearly stated and reflected in the type and scope of operations analyzed in the SAR.

   The Site mission and scope of operations to achieve Site closure are discussed in the Executive Summary in Section 1.1.2 Scope, Section 1.3 Site Mission.

   Assessment: These sections are consistent with the vision for the future of the Site as outlined in the Rocky Flats Cleanup Agreement and the 2006 Closure Plan. For Building 881, Section 2 Facility Description and Activity Characterization adequately defines what is authorized in the facility and contains sufficient detail to support the hazard identification process summarized in Chapter 4 of the SAR. However, with the exception of the Building 881 FSA, on-site transportation and the natural gas/propane activities, there are no activities identified or analyzed in the Site SAR. Rather, the contractor identified the types of hazards that exist outside of what is covered in nuclear Hazard Category 2 and 3 AB documents. Until this information was gathered together into the Site SAR, the determination of hazards and safety basis was performed using the MAL process.

   The Site SAR basically authorizes all Site activities not covered by a Hazard Category 2 or 3 nuclear facility authorization basis. However, it does not specify the individual activities currently conducted and new activities required to achieve Site closure. In addition, the Site SAR does not address the stepping down of controls as the hazards are reduced and eliminated. The RFFO did not perform an exhaustive walkdown to verify that all hazards had been identified for below Hazard Category 3 facilities/activities. However, RFFO's review concluded that the identification appears to be complete. Moreover, it is the complete implementation of Integrated Safety Management System (specifically, the Activity Screening Process and the Integrated Work Control Program) which provides RFFO with a level of confidence that hazards are required to be identified and screened against those already in the Site SAR.

   Conclusion: The Site SAR adequately meets this criteria.

2) The descriptions of the facility, operations, and systems providing important support to facilities and departments or activities important to safety provide a knowledgeable reviewer sufficient background material to understand the major elements of the safety analysis.

Chapter 2 (Site Description and Characteristics) provides descriptions of the Site and systems providing important support to facilities and departments or activities important to safety. Section 3.3, Site Support Systems and Utilities Description identifies the function/purpose (i.e., mission) for support systems and utilities.

Assessment: The SAR provides an adequate level of detail for these descriptions. These sections provide a comprehensive, consolidated description not found elsewhere which will provide consistency Site-wide. The descriptions clearly identify how the systems providing important support to facilities and departments or activities important to safety are linked to the provision of service to a nuclear facility and support technical safety requirements, operational safety requirements or operational controls identified in individual facility authorization basis documents.

The Site support systems that are not directly covered in individual facility AB documents but are credited as necessary to support the safe operation of Site facilities are:

- Fire protection water supply
- Site electrical power
- Site alarm systems
- Site steam and condensate
- Site nitrogen supply and
- Site propane and natural gas systems.

The fire protection water supply is important since many AB documents for Site facilities credit this system in their accident analysis. It is relied upon for the mitigation of consequences in the event of a fire both as sprinkler coverage for fire suppression and flow alarms for notification of the fire department. The loss of this system due to failures on the distribution network impacts fire protection and emergency response capabilities.

The site electrical power provides electrical service to all Site facilities and has the potential to impact facility operations through 1) loss of electrical power and 2) initiation of a fire from electrical shorts. The most significant hazard associated with this system is the high voltage.

The Site alarm systems provide the means to transmit alarm and communication signals. Systems essential to facility safety include fire and criticality alarms (including the Life Safety Disaster Warning System). The fire and security alarm function is to protect personnel and property by alerting emergency response services to the occurrence of fire, or breach of security, for prompt evacuation of area occupants, and for automatic actuation of certain fire suppression functions. Alarm signals are originated from the fire phone and pull boxes, heat and smoke detectors, fire suppression system, flow alarm actuation, criticality, and several types of security alarms. Portions of the fire system do not meet National Fire Protection Association code requirements by using "non-listed" equipment, incomplete monitoring by the dispatch center, lack of backup emergency power in some areas, and some annunciation deficiencies. There is an issue with the criticality alarm not being loud enough to be heard over background noise in specific areas of the Site. This is addressed in the JCO discussed in Section 2.1 of this Review Report. All alarm panels must be capable of properly receiving and transmitting alarms.

The Site steam and condensate system consists of Building 443, and Facilities 211, 240, and 710 and provides heating and processing steam for the site. No critical process applications have been identified that would result in an unsafe condition if steam supply is lost. However, steam is required to vaporize the liquid nitrogen to provide backup nitrogen to the inert gloveboxes in Buildings 371 and 707. There are no hazards associated with these systems that would directly result in a release of radioactive materials or chemicals.

The Site nitrogen supply is provided by the Nitrogen Plant (Building 223) which produces, stores and distributes nitrogen which is primarily used for inert atmospheres in plutonium gloveboxes and storage areas to prevent fire. If nitrogen generation is interrupted, the liquid nitrogen reserve is automatically engaged which has the capacity of three to four days. This is not a clear definition of the required supply based on what is needed for

the buildings. This must be more clearly defined (see Appendix D). The hazards associated with the Nitrogen Plant are standard industrial hazards.

The propane and natural gas systems provide fuel to the site primarily for heating buildings and waste storage tents and trailers beyond that supplied by the steam plant. The hazards of these systems are discussed in detail in Chapter 3 of the Site SAR and Section 2 of this Review Report.

The Emergency Operations Center including the meteorological tower operations is included as an SEC since the EOC is required in the event of an emergency involving the release of a hazardous material.

The following departments or activities provide services or activities important to safety and were used in development of the SMCs:

- Fire and Emergency Services,
- Pressure Relief Devices, and
- Emergency Response Organization.

Fire and Emergency Services are essential for nuclear and life safety at the Site. AB documents for individual facilities take credit for the Site Fire Department to minimize MAR involvement in the event of an accident involving a fire or rely on it as defense-in-depth.

Safety of Site workers is contingent upon proper operation of pressure relief devices in pressurized systems. The testing and maintenance of these systems is essential to provide worker safety with the presence of pressurized systems. This is further discussed in Chapter 7 of the Site SAR and Section 2.1 of this Review Report.

The Emergency Response Organization provides essential response activities in the event of an accident and ensures that an appropriate staffing level of qualified individuals is maintained to respond to accidents.

Conclusion: The Site SAR adequately meets this criteria when assessed in conjunction with the JCOs listed in Section 2.1 of this Review Report.

3) The status of the existing authorization basis is adequately identified to establish the current set of authorization basis documents, including specific versions and levels of approval.

This criterion deals with the content of Section 1.4 (Authorization Basis History), Section 1.5 (Safety Evaluations for RFETS Facilities and Activities) and Section 1.6 (Master Activity List).

Assessment: The previous Site-wide authorization basis was never approved by RFFO, specifically the Interim SAR. During the Authorization Basis Process Improvement Team era, the lack of a Site-wide AB was recognized. The resolution to this issue was to establish the Master Activity List (MAL) which became the mechanism for capturing the AB for mission and baseline activities. The MAL is not an AB document. The current description of the MAL in Section 1.6 is outdated (even as of June 1998). The existing Section 1.6 of the Site SAR should be replaced with the following:

> The MAL has been used as a tool to help ensure authorization existed for performing activities. Currently, the Integrated Safety Management System (ISMS) ensures that activities performed at the Site have adequate authorization. For DOE-STD-1027-92 Hazard Category 2 and 3 nuclear facility activities, the Authorization Basis Document List and the ISMS, through the use of the Activity Screening Process and the Nuclear Safety Unreviewed Safety Question Determination process, ensure that the authorization basis is identified and reviewed for adequacy prior to performing work. For non-nuclear activities, the Site SAR identifies the SMPs that affect the ISMS which , in turn, ensures that appropriate authorization (i.e., operational basis for non-nuclear activities) exists.

This is addressed in Appendix C.

Without having a Site-wide AB document, issues such as LLW/LLMW wooden crate outdoor storage, pressure safety, on-site transportation, etc. required the development of stand-alone analyses and safety bases which was difficult and time consuming. Regardless, it is intended that the MAL be canceled upon final implementation of the Site SAR. Since the Interim SAR did not contain controls, there have been no assessments to determine compliance with the Interim SAR. In addition, there are no USQDs associated with the Interim SAR since it was not an RFFO-approved document and was not designed or used in this manner from its date of issuance. Section 1.5 of the Site SAR identifies the process which is to be used once the Site SAR is implemented for the facilities and activities covered by the Site SAR. This process combined with adequate implementation of Integrated Safety Management System should provide sufficient assurance that activities will be appropriately screened, analyzed and controls identified.

The Site-wide JCOs should be included in the Site SAR. This is addressed in Appendix C.

Conclusion: With the incorporation of the identified items in this section of the Review Report into the next annual update, the Site SAR adequately meets this criteria.

4) Correlation is established between actual Site and facility arrangements and operations with those stated in the SAR (i.e., the basic descriptions provided are fundamentally up-to-date and correct).

This criteria addresses the accuracy of the information primarily contained in Chapters 2 (Site Description and Characteristics) and 3 (Site Configuration, Support Systems and Utilities) and Section 2 (Facility Description and Activity Characterization) of the Building 881 FSA in Volume II.

Assessment: During the review process, the Review Team verified that the information provided against the current Site and systems since it has endured a lengthy development period. Several team members have past experience with specific facilities as well as knowledge of Site systems and support activities including their role in the closure process. In addition, Section 1.8 states that due to the great flux of activities and individual facility missions, "periodic updates are expected to be performed as necessary but at least annually as required by DOE Orders." This commitment will be reiterated in the Site SAR Authorization Agreement. However, the Site SAR failed to exclude chlorine, sulfur dioxide, Building 771 residues, Building 886 HEUN and did not address transportation of high Americium residue drums. This is addressed in Appendix C of this Review Report.

In addition, the building inventories do not represent the current Site configuration. This should be updated in the next annual update of the Site SAR (see Appendix C). The recently identified issue regarding selection of solubility class for individual facility AB documents should be resolved and corresponding analyses updated. This is addressed in Appendix C.

Conclusion: The Site SAR does not meet this criteria, and there is technical direction to address the items identified in this section. The Site SAR is not current in reflecting facility arrangements and operations. The Site SAR reflects having chlorine, sulfur dioxide, and Building 771 residues and does not address high Americium residue drums being transported. Due to the rapidly changing configuration that the Site will undergo, there will be a need to update the Site SAR on a regular basis (i.e., annually). This commitment will be reflected in the Site SAR Authorization Agreement.

5) The Site-wide and facilities contractor development and approval processes demonstrate sufficient commitment to establish the Site-wide safety basis.

This criteria addresses the contractor process used for development and approval of the SAR, rather than a specific chapter or aspect of the SAR. The adequacy/inadequacy of the process is not necessarily reflective of the adequacy and quality of the product (i.e., the Site SAR). However, it is reflective of the efficiency of producing a quality document and level of RFFO involvement required to produce an acceptable authorization basis for the Site.

Assessment: A new authorization basis has been under development for the Site since before 1996. The Site SAR has never been a funding or milestone priority for the RFFO or the contractor. Despite this, the contractor has issued a coherent, quality document which has required input by numerous organizations and individuals and is not reflective of the number of different developers, reviewers and approvers experienced in its development process.

More recently, an issue revealed during the final phase of the Review Process indicates that "ownership" of the Site SAR may not be adequate which has caused a delay in resolution of significant issues primarily associated with implementation. While this will not prevent approval of the Site SAR, successful implementation is dependent on clear leadership, vision of implementation and direction within K-H and down through its primary subcontractors. To date, there appears to be a lack of understanding on how the Site SAR will be implemented as well as how noncompliances will be identified, tracked and trended.

In addition, since the majority of the accident analysis (composite risk) was performed using median weather, it will make it difficult to evaluate the impact of discovery issues on composite risk. The USQD procedure (3-J69-NSPM-5C-01) should be revised to incorporate Table 2-9 of this Review Report to evaluate the cumulative impact of a discovery issue or proposed change on composite Site risks. Additional procedural guidance should be developed as necessary and changes be proposed to Table 2-9 if an individual facility AB (excluding JCO risks that are accepted for a temporary period until the issue is resolved) results in higher risks (i.e., consequence for a frequency bin). This is addressed in Appendix B.

Conclusion: An adequate safety basis was developed despite the lengthy development, review, and approval processes. With the implementation of the stated technical direction and in the accompanying memorandum, this criteria is met.

6) A description of the Site and facilities' life-cycle stage, mission(s), and operation(s) is presented, including explanation of the impact on the Site and facilities safety basis.

This criteria primarily addresses the information contained in Sections 1.3 and is scattered throughout Chapter 3 in the support systems and utilities descriptions.

Assessment: The magnitude of activities covered by the Site SAR and the flux of individual facility missions presents a challenge to the contractor in keeping safety basis analysis and information current. The descriptions provided in the Site SAR are clearly linked to Site Closure and support to other facilities (particularly Hazard Category 2 and 3) through demolition. Keeping these descriptions current will require great awareness of the Site SAR and its contents by individuals responsible for ensuring that missions and operations remain within the established safety basis. The Site SAR does not provide an in-depth description of the stepping down of controls as hazards are reduced and eliminated. Rather, it looks at the worst case in the Closure Case which provides a bounding analysis instead of realistic intermediate points. Since the actual path to Site closure remains in great flux, RFFO recognizes that it is not possible to discuss in any detail the elimination of controls with great certainty. Rather, this will be addressed in facility-specific AB documents.

Conclusion: The SAR adequately meets this criteria.

7) Clear basis for and provisions of exemptions, consent agreements, and open issues are presented.

Consent agreements are not addressed explicitly in the Site SAR and are in general addressed at the Safety Management Program level (e.g., consent agreements with the State of Colorado would be captured in the Waste Management and Environmental Protection Program). No open issues were identified in the SAR.

Assessment: No exemptions were requested in the SAR, and the RFFO review did not identify any exemptions that were necessary for approval of the Site SAR. However, the contractor has requested an exemption regarding pressure safety requirements. In addition there are a number of NFPA exemptions which the Site has had approved over the years. Table 5-1 identifies the approved and open variances, exemptions, and CSAs

requested by the contractor. Upon implementation, the contractor must analyze the cumulative affect of these exemptions and CSAs against the Site SAR analysis and controls. This is addressed in Appendix D.

Table 5-1. Approved and Open Exemptions

Identifier	DOE Order	Request Title	Status
VR-053	O 6430.1A	Use of Electrical Metallic Tubing (EMT) Versus Rigid Steel Conduit for Alarm Communication Lines	Approved
CSA-014H	O 5480.7	Detection System, Central Alarm Station, Building 121	Approved
CSA-016I	O 5480.7	Replace Fire/Security System	Approved
CSA-018G	O 5480.7		Approved
CSA-019G	O 5480.7	Automatic Sprinklers Protection beneath four feet and wider HVAC Ducts, B-707	Approved
CSA-021A	O 5480.7	Use of Non-Listed Filter Plenum Automatic Deluge Valves	Approved
CSA-022E	O 5480.7	Install two conveyor line fire doors in fire barrier walls, B776/777	Approved
CSA-039F	O 5480.7	Extension of Automatic Sprinkler System in Tunnel area of B-881	Approved
CSA-055C	O 5483.1A	General Environmental Controls, Subpart J	Approved
CSA-059B	O 5483.1A	Fire Protection Subpart L	Approved
CSA-060C	O 5483.1A	Material Handling and Storage, Subpart N	Approved
CSA-061B	O 5483.1A	Toxic and Hazardous Substances, Subpart Z	Approved
CSA-062B	O 5483.1A	Walking and Working Surfaces, Subpart D	Approved
CSA-072B	O 5483.1A	Occupational Health and Environmental Control, Subpart B	Approved
CSA-085B	O 4580.5	Criticality Alarm System	Approved
CSA-094	O 5480.1	Hazard Inventory System	Approved
CSA-103B	O 5483.1A	Hazardous Material , Subpart H and Compressed Air and Compressed Air Equipment	Approved
EX-001	O 5480.7	Use of Fire Dampers with HVAC Ductwork	Approved
EX-027A	O 5480.7A	Sprinkler Installation for Membrane Structure, Tent 6	Approved
EX-29	O 6430.1A	Airborne Effluents for Building 440	Approved
EX-033C	O 420.1	Criticality Accident Alarm System	Approved
EX-34	0 6430.1A	Class 5 Vault Door Exemption to UL 155	Approved
EX-36	O 440.1	Operational Area Exit Stairways	Approved
EX-37	O 440.1	Building 317 Egress Modifications	Approved Temp
EX-40A	O 440.1	Pressure safety deficiencies	Open
EX-42	O 6430.1A	Trench 1 Tent Structure Exemption to loss limitation & Fire Hydrant Spacing Criteria	Approved
EX-42 rev.2 EX-042A	O 6430.1A	Trench 1 Tent Structure Exemption to loss limitation & Fire Hydrant Spacing Criteria	Approved
EX-042C	O 6430.1A	Trench 1 Tent Structure Exemption to loss limitation & Fire Hydrant Spacing Criteria	Approved
EX-43	O 232.1	Permanent Exemption for Annual Site Environmental Report.	Open

VR-053	O 6430.1A	Use of Electrical Metallic Tubing (EMT) Versus Rigid Steel Conduit for Alarm Communication Lines	Approved

Conclusion: With analysis required upon implementation addressed in Appendix D, the SAR adequately meets this criteria.

5.2 ADEQUACY OF SITE-WIDE HAZARD ANALYSIS

Criterion: The analysis is comprehensive and inclusive of hazards present Site-wide.

This is addressed in Chapters 4 (Site Hazard Assessment) and 5 (Natural Phenomena and External Events) of the Site SAR and Chapter 9 (Composite Risk). Chapter 8 (Transportation Safety Analysis) is assessed in Appendix A of this Review Report.

Assessment: Chapter 4 provides a systematic identification of the Site-wide hazards using the standard hazard checklist used in developing new facility AB documents of 26 hazards. In addition, this chapter identifies facility interactions and interactions with nearby facilities as potential hazards. For each of the 26 hazard types, there is a table identifying the following:

- Hazard/Energy Source
- Description
- Preventive and Mitigative Features
- Remarks

This provides a comprehensive listing of the Site-wide hazards not specifically included in another AB document or in an FSA in Volume II. The analysis performed in Chapter 9 of the Site SAR takes the hazards analysis performed in the individual Hazard Category 2 and 3 AB documents and analyzes the composite hazards. In addition, the Site SAR analyzed operational, seismic, wind and aircraft hazards to determine composite risk. Section 2 of this review report provides the summary conclusions of the analysis.

The explosion analysis was significantly expanded after an explosion analysis course was held at the Site, specifically, regarding the UVCE analysis. As stated in Section 2 of this Review Report, the new analysis identified much less damage than was identified in previous analysis. The RFFO, using a subject matter expert subcontractor, independently validated this analysis and concurs with the results (Reference 8). However, the contractor had committed to phasing out propane and replacement with natural gas. In addition, the contractor identified the action to analyze the natural gas lines leading up to a facility and in validating that the natural gas lines internal to the facilities were purged prior to being blanked at the facility boundary. These issues are addressed in Appendix D, to be addressed upon Site SAR implementation.

Chapter 5 identifies the natural phenomena and external event hazards. This chapter adequately identifies these hazards and is consistent with other recently approved AB documents. However, section 5.4 (Heavy Rains)— identifies the following areas as vulnerable to flooding during a 25-year storm event under present conditions. These areas are the Buildings 335, the vicinities around Building 991 and between Buildings 444 and 460, as well as several T452 and T771 trailers. The Site SAR states "these areas should not be used to store materials that could be damaged by exposure to moisture or potential flooding conditions unless appropriate physical precautions are taken." However, the Site SAR does not identify any controls to restrict storage in these areas or to implement physical precautions. In addition, the descriptions of the areas of concern should be more detailed so that the storage prohibition is not overly restrictive. This is addressed in technical direction.

Since the inventories are not current, the corresponding risk analysis results are also outdated, especially for Building 886 HEUN solutions. This is addressed in Appendix C.

Conclusion: There are a number of items listed in Appendices B, C and D with regard to this criterion. The ones of concern deal with performing a more complete analysis of some of the Site hazards. These must be addressed prior to Site SAR implementation. With the completion of the stated technical direction, this criterion is met.

5.3 ADEQUACY OF DERIVATION AND DEVELOPMENT OF OPERATIONAL SAFETY CONTROLS

Criterion: Operational Safety Controls are clearly identified including their bases for derivation, corresponding surveillance requirements, and criteria for determining functionality.

This is addressed in Chapter 7 (Operational Controls) and in Section 4 (Operational Controls) of the FSAs for Building 881 and Fuel Gas Systems.

Assessment: Operational Controls are defined in the Site SAR addressing "site-wide systems that are not directly covered in individual facility authorization basis documents, but are credited as necessary to support the safe operation of site facilities." The following were identified as being important support to facilities:

- Fire protection water supply
- Site electrical system
- Site alarm system
- Site steam and condensate
- Site nitrogen supply, and
- Site propane and natural gas systems.

These systems are described in detail in Chapter 3 (Site Configuration, Support Systems and Utilities) of the Site SAR. Chapter 7 identifies two types of Operational Safety Controls: Site Engineered Controls (SECs) and Site Management Controls (SMCs). SECs include requirements for systems or components important to safety by maintaining systems supporting facilities with the potential to release radiological or hazardous materials. Surveillance requirements and required actions are identified for the SECs. Section 7.4 of the Site SAR identifies the general guidelines for the SECs including what it means to implement an SEC, a Required Action when an SEC is not met, and failure to implement a Required Action. While notification of the Shift Superintendent within one hour is required whenever an SEC is not met, there is no requirement to notify the affected facilities. The contractor agrees that this needs to be added to the Required Actions. This is addressed in technical direction. In addition, there is no functionality defined for the systems in the SECs. Therefore, the RFFO will assess the list of procedures which support the surveillances as part of its oversight of the IVR (see Appendix D). In addition, RFFO will assess whether or not there is a supporting process for change control of the information in those procedures.

Section 3.3.3.2 of the Site SAR lists three controls and an action to phase out and replace propane with natural gas. The corresponding Site Engineered Controls (SEC 7 and 8) only address two of the three actions listed in Section 3.3.3.2. SEC 7 is "Parking in the vicinity of propane tanks shall be controlled." SEC 8 is "Pressure relief valves on propane tanks shall be maintained to ensure proper operation." An SEC to control the ignition sources within 20 feet of the propane tanks must also be implemented. This is addressed in the RFFO technical direction. In addition, RFFO will verify as part of its oversight of the contractor's IVR the progress on phasing out propane and replacement with natural gas (addressed in Appendix D).

Since the SECs do not define functionality, RFFO will determine the adequacy of a listing of procedures which support the surveillances to ensure the functionality is defined. RFFO will also review these procedures. This is addressed in Appendix D.

As an example, SEC 1 is to "ensure the fire protection water supply system is capable of supplying firewater to facility fire suppression systems and fire hydrants." The three things that it is looking to ensure are: 1) Adequate firewater supply is available, 2) distribution system allows flow of firewater, and 3) Building 928 fire pumps are available. There are three surveillances associated with this SEC: 1) verify an adequate firewater supply is available, 2) verify the distribution system allows flow of firewater to facility fire suppression systems and fire hydrants, and 3) verify the fire pumps can function to supply firewater to facility fire suppression systems and fire hydrants. The surveillances are performed in accordance with contractor procedures. However, not knowing which

procedures or the parameters surveilled, it is not possible to determine the functionality of the system. This is addressed in Appendix D. The Required Actions are: 1) Notify Shift Superintendent of the out-of-service condition within 1 hour to allow notification of facilities, 2) perform engineering evaluation to determine allowable time period the Site can safely tolerate the out-of-service condition based upon the current Site conditions, and 3) correct the deficiency as required by appropriate procedures. Notify the Shift Superintendent when the out-of-service condition is corrected. The bases for this control is that many AB documents for Site facilities credit the fire protection water supply system, including the redundancy of supply, in their accident analysis. This system is important to these facilities because it is relied upon for the mitigation of consequences in the event of a fire both as sprinkler coverage for fire suppression and flow alarms for notification of the fire department.

The preventive and mitigative controls for Building 881/881F are focused on combustible controls since its nuclear material is in the form of hold up or waste storage. The bases for the SECs, SMCs and controls for Building 881/881F adequately tie the control to the facility need for which the control is necessary. Table 2-11 of this Review Report identifies the individual SECs and SMCs as well as the controls for Building 881/881F. The bases for derivation of the controls is that these systems and departments are either credited in an individual AB document or are essential to providing a Site service (e.g., electrical power).

The SMCs are placed on departments or activities that provide service or activities important to safety. These are identified for the following support functions:

- Fire and emergency services
- Pressure relief devices
- Emergency response organizations

The bases for these controls adequately tie the control to the need for the service activity. Neither SECs or SMCs are AB-level controls (i.e., TSRs). However, they are intended to be controls which are RFFO-approved and enforced by the contractor. The method for dispositioning noncompliances should be consistent with the RFFO direction on the LLW/LLMW wooden crate JCO. This is addressed in the RFFO technical direction.

As an example, SMC-1 is to "maintain a trained, qualified, and adequately staffed Fire and Emergency Services Department at RFETS 24 hours per day." The bases for this control is that existing AB documents identify a 15-minute RFETS Fire Department response time to control or mitigate fire scenarios. Some areas depend on the response time instead of an automatic fire suppression system. Environmental agencies and permits, such as RCRA, require the availability of hazardous material cleanup equipment. In addition, this Department is essential for nuclear and life safety at the Site.

With the RFFO approval of the Site SAR, these controls become enforceable in the AB realm. While the impact of not meeting a control does not correlate to the same significance as if the control were a TSR, the controls maintain these systems available to affected Site facilities/activities. Therefore, it is essential that noncompliances are tracked and trended to identify if there is a programmatic deficiency. In addition, the contractor should always take prompt action to establish a safe configuration any time a noncompliance is identified. This is addressed in Appendix D.

The *Emergency Preparedness Hazards Assessment* application of DOE-STD-3014 that has been performed for 18 facilities for a Site SAR AB evaluation of aircraft crash risks should be built upon to determine whether additional controls (e.g., building or segregation area MAR limits) are warranted. This is addressed in Appendix C.

The inconsistency discussed in section 2 of this Review Report regarding the crediting of the lightning protection as a design feature when it is also stated that the lightning protection systems have fallen into a state of disrepair and cannot be relied upon to provide the needed protection must be resolved. This is addressed in Appendices C and D.

Conclusion: RFFO's review identified four new controls that must be addressed prior to implementation. These are identified in Appendix B, items 1-3 and 5. Once these are appropriately incorporated, this criterion is met.

5.4 ADEQUACY OF PROGRAMMATIC CONTROLS

Programmatic controls encompass the elements of institutional programs and facility management that are necessary to ensure safe operations based on assumptions made in the hazards and accident analyses. In the Site SAR, programmatic controls are identified as Safety Management Programs in Chapter 6. DOE-STD-1104-96 indicates:

> "Determining the adequacy of programmatic control generally entails being able to conclude that the [BIO] contains sufficient documentation and basis to arrive at the following conclusions: the major programs needed to provide programmatic safety management are identified, and basic provisions of identified programs are noted, and references to facility or site program documentation are provided."

While this is not a BIO, the same tenant applies to the SMPs in the Site SAR.

The acceptance of the programmatic control described in the SAR does not constitute acceptance of the adequacy of program compliance with DOE directives, statutes, and regulations. That can only be accomplished by detailed compliance review of each of the programs, which is well beyond the scope of the Site SAR review. Adequacy of the Programmatic Controls is evaluated based on the following criteria:

1) The major programs needed to provide programmatic safety management are identified.

The SMPs are described in Chapter 6 (Safety Management Programs) and are listed below:

- Integrated Safety Management
- Organization and Management
- Configuration Management
- Corrective Action
- Decommissioning
- Emergency Preparedness
- Engineering Program
- Environmental Management
- Fire Protection
- Independent Safety Review and Assessments
- Safety and Industrial Hygiene
- Maintenance
- Nuclear Safety
- Occurrence Reporting
- Operations Program
- Quality Assurance
- Procedures
- Radiation Protection
- Records Management and Document Control
- Safeguards and Security
- Training and Qualification
- Transportation
- Waste Management Program

Assessment: The programmatic controls are clearly defined in the Site SAR though not in as much detail as what was expected by RFFO. The SMPs identified in Chapter 6 provide a baseline for the Site-wide SMPs. They provide the generic practices to be used Site-wide to ensure operations and activities are performed in a responsible manner with regard to human health and safety and environmental protection. Specific aspects require implementation on a facility-specific basis and are addressed in the appropriate sections of other AB documents. However, there is not a commitment to perform self-assessments of the SMPs or to track and trend any deficiencies. In addition, the SMP descriptions in the Site SAR are less robust than what appears in individual AB documents. There are no details of program requirements, key assumptions upon which the

programs rely or key commitments by the contractor. The original expectation was to have the SMPs described only in the Site SAR and have individual AB documents reference the Site SAR description and provide deviations or additions unique to the facility. Eventually, the contractor intends for descriptions in the individual AB documents to become consistent with the descriptions in the Site SAR. In the meantime, whichever is the more restrictive description will be enforced. These descriptions appear consistent with those contained in recently approved AB documents.

However, the contractor must identify the flow down of requirements from the DOE Orders listed in the contract (List B) to the Manuals. RFFO approves only some of the manuals, it does review many of them via the assessment process. This is addressed in Appendix D. The RFFO has assessed the majority of the Site manuals and will continue to assess the remainder as identified in the Comprehensive Assessment Schedule. In addition, the issues surrounding compliance and enforcement of the SMPs will be resolved as part of the AC template development resulting from the AB Summit.

Conclusion: This criterion is met.

2) Basic provisions of identified programs are noted, and references to facility or site program documentation are provided.

This criterion is addressed in Chapter 6 (Safety Management Programs).

Assessment: The descriptions provided in Chapter 6 provide a description of the basic functions of the programs, and refer to Site procedures that implement the provisions of the programs.

Conclusion: This criterion is met.

6.0 REFERENCES

1. DOE-STD-3009, Preparation Guide for US Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports.
2. DOE-STD-1027-92, Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports
3. DOE-STD-3011, and Guidance for Preparation of DOE 5480.22 (TSR) and DOE 5480.23 (SAR) Implementation Plans
4. DOE-STD-1104-96, Review and Approval of Nonreactor Nuclear Facility Safety Analysis Reports
5. Rocky Flats Cumulative Impacts Document, June 1997.
6. U.S Department of Energy, *DOE Facts: Department of Energy Declassifies Location and Forms of Weapon-Grade Plutonium and Highly Enriched Inventory Excess to National Security Needs.* "Openness Initiative," enclosed with a cover letter to stakeholders from J. David Nulton, Director, NEPA Compliance & Outreach, Office of Fissile Materials Disposition. February 8, 1996.
7. EG&G Rocky Flats. Analysis of Off-site Emergency Planning Zones for the Rocky Flats Plant. NSTR-003-92. Prepared by A.C. Stalker, et.al. Nuclear Safety Engineering. Golden, Colorado. May 1992.
8. Memorandum from Geoff Kaiser (SAIC) to Terry Foppe (SAIC), dated 6/8/98; subject: Review of Site Fuel Gas Systems Hazard Analysis (CALC-RFP-98.0555-RGC) Performed for the Rocky Flats Site by the Kaiser-Hill Company, and the Rocky Flats Environmental Technology Site Safety Analysis Report, Rev. 0, April 1998.
9. Memorandum, Grumbly to distribution, Delegation of Review and Approval Authority for Safety Documentation and for Startup/Restart for Environmental Management Field Activities, August 8, 1994, U.S. Department of Energy, Washington, D.C.

Appendix A
RFFO Review of Site SAR Transportation Risk Assessment

TABLE OF CONTENTS

TABLES

APPENDIX A

RFFO REVIEW OF TRANSPORTATION RISK ASSESSMENT

Appendix A
RFFO Review of Site SAR Transportation Risk Assessment

A.1 BACKGROUND

The current document that authorizes transportation of hazardous and radioactive materials across the Site is the Kaiser-Hill *Site Transportation Manual Series* (1-T91-Traffic-100, 101, 110, 112, 115, 120, 121, and 401), which is not an authorization basis document. DOE's approval of the Transportation Manual focused on meeting Department of Transportation (DOT) requirements (or their equivalencies for on-site conditions) and security aspects of the Manual, not on the nuclear safety risks and controls to prevent or mitigate accidents. RFFO required an on-site transportation risk assessment to support the salt residue stabilization program to assure that appropriate nuclear safety controls were identified and required (K-H 1997a). To establish an AB for on-site transportation, the Site Safety Analysis Report (SAR) includes accident analysis of on-site transportation risk of Category I and II special nuclear material (SNM), all other residues, radioactive wastes, and other hazardous chemicals. This appendix is a discussion of this Site SAR risk assessment and controls, DOE's bases for approval, and DOE direction including additional controls as presented in Appendix B as part of the Site SAR approval, or Appendix D to be completed during implementation. This appendix also includes comments to be incorporated into an annual update of the Site SAR, as presented in Appendix C.

A.2 REFERENCES

K-H 1987a *Salt Stabilization Program Transportation Risk*, Nuclear Safety Technical Report NSTR-105-97, Safe Sites of Colorado, October 15, 1997

K-H 1998a K.K. Kunert, *Site SAR Transportation Safety Analysis*, CALC-RFP-98.0570-KKK, Kaiser-Hill, April 30, 1998

K-H 1998b K.K. Kunert, B.M. Meale, and A.R. Stithem, *Evaluation of Risk Associated with Transportation Activities Within the Protected Area*, Nuclear Safety Technical Report NSTR-018-97, Kaiser-Hill, January 22, 1998

K-H 1998c M.A. Natzke, *Site SAR Transportation Evaluation: Nonradiological*, CALC-RFP-98.0660-MAN, Kaiser-Hill, May 7, 1998

K-H 1998d K.K. Kunert, *Site SAR Transportation Analysis for Fuels and Off-site Events*, CALC-RFP-98.0717-KKK, Kaiser-Hill, April 30, 1998

A.3 TRANSPORTATION RISK ANALYSIS

The Site SAR transportation risk assessment of radioactive material transfers is documented in Chapter 8 and CALC-RFP-98.0570-KKK (K-H 1998a). This assessment evaluates on-site transfers of radioactive materials including Category I and II SNM, residues other than high-americium salts, transuranic (TRU) wastes, and low-level wastes (LLW) (including mixed TRU and LLW). This Site SAR evaluation replaces a previous risk assessment of SNM and residue transportation activities in the Protected Area (K-H 1998b) which was initially developed to support an interim Authorization Agreement, but was updated and modified for the Site SAR. However, the Site SAR does not address high-americium salt transfers but should have (see DOE technical direction in Appendix D).

Consistent with the previous risk assessment for salt residue transportation (K-H 1987a), this risk assessment of radioactive material transportation evaluates the same eight accident scenarios. Five accidents are analyzed based on the probability of a vehicle crash, followed by a spill and/or fire. Two accidents involve a single container fire and explosion. One accident is a transport vehicle truck fire, not caused by a vehicle crash. The eight accidents are as follows:

1. Truck accident with no release. (0 to 11 mph)
2. Truck accident resulting in a minor spill (11 to 30mph)
3. Truck accident resulting in a medium spill (30 to 55mph)
4. Truck accident resulting in a major spill (55 to 80 mph)
5. Truck accident resulting in a fire (any speed)
6. Vehicle fire spreads and involves three drums (initiated by electrical fire)
7. Drum or waste box ruptures due to hydrogen buildup/ignition
8. Movement disturbs reactive or pyrophoric material resulting in a fire.

CALC-RFP-98.0570-KKK applies frequency estimates for transportation accidents from NUREG/CR-0170 *(Final Environmental Statement on the Transportation of Radioactive Material by Air and Other Modes)* that evaluated offsite transportation risks in the 1970's for some of the accidents, and applies qualitative frequency estimates for others not involving vehicle crashes. The frequency of transportation accidents involving crashes are determined based on a unit frequency of 1.71 E-6 accidents/mi (1.06 E-6 accidents/km) based on highway accident rates. The frequency is also based on different forms of material-at-risk (MAR): plutonium (Pu) oxide representing Category I and II SNM movements, an "average" residue movement (excluding salts and high americium-plutonium residues), TRU wastes, and LLW. On-site transportation mileage is conservatively estimated to be 200 mi/yr for SNM, 1000 mi/yr for solid residues, 100 mi/yr for liquid residues, 20 mi/yr for high concentration liquid residues, 560 mi/yr for TRU drums, 1,400 mi/yr for TRU boxes, 560 mi/yr for LLW drums, and 1,400 mi/yr for LLW boxes. Additional adjustments are made to estimate the frequency of five accident collision scenarios as follows:

1. Based on the previous salt transportation risk assessment, the accident frequencies are further modified to account for lower accident frequencies on DOE sites, rather than offsite transportation, and for a probability of breaching containers. This probability adjustment is based on engineering judgment that probability decreases as vehicle speed increases, and therefore the frequency of an accident should be lower as a function of increasing speed. The formula applied is the inverse of speed (i.e., probability = 1/speed) which produces a reasonable range for probability reductions for on-site accidents (i.e., one to two orders of magnitude reductions).
2. Probability adjustments for greater severity accidents are based on the NUREG/CR-0170 adjustments for increasing speed (an inverse relationship resulting in lower probabilities) and/or resulting fires.
3. The Scenario 6 fire frequency is reduced by a probability of 5E-4 (50%*0.1%)[1] to account for the estimated probability that transport vehicle fuel will involve the metal truck bed and the resulting fire will burn through the metal truck bed before the fire department can extinguish the fire.
4. A new probability adjustment factor for MAR form being present is included based on exposure time.

The radiological consequence analysis is consistent with the methodology and assumptions used for Basis for Interim Operation (BIO) documents and the previous Salt transportation risk assessment (e.g. airborne release fraction, respirable fraction, dispersion and dose assessment, etc.). MAR is conservatively estimated based on vehicle capacities and criticality safety limits or shipping limits per drum as: 5 kg of weapons grade (WG) plutonium (Pu) in the form of metal or oxide, 1 kg WG Pu for average residues, 200 g of liquid, 200 g of TRU (or 320 per box), and 0.5 g LLW (or 3 g per box). MAR does not include high-americium residues that were evaluated in the salt transportation risk assessment. A drum damage ratio is applied ranging from zero (i.e., no release below an 11mph crash) up to 100 percent of contents involved in the accident (i.e., greater than 55 mph crashes) for the five crashes. An average MOI distance of 1900 m was selected which represents approximately the center of the Protected Area to the minimum Site boundary. Some distances for transfers could be shorter, e.g., from Building 371 could be 1500 to 1600 m, which would result in a 30% to 40% increase in consequences, and this impact would be greater for Building 440 TRU waste accidents or hazardous chemicals. However, this does not significantly increase the dose estimates to cause an increase in the consequence level assignment (e.g., from *Moderate* to *High*) or Risk Class.

The risk assessment also applies the BIO methodology for frequency bins (i.e., *Anticipated*, *Unlikely*, and *Extremely Unlikely*), consequence levels (*High*, *Moderate*, and *Low*) and risk classes (i.e., I through IV). Per DOE

[1] This probability adjustment is a factor of 20 lower than assumed for the salt transportation risk assessment – see later discussion.

Standard 3011, *Incredible* or *Beyond Extremely Unlikely* scenarios are included in the *Extremely Unlikely* bin for the purpose of assigning a risk class due to the qualitative nature of the Preliminary Hazards Analysis methodology. However, for selection of appropriate Technical Safety Requirements (TSRs), *Incredible* accidents may or may not be considered depending on such factors as their contribution to overall risk and how low the frequency estimate is (e.g., well below 1E-7/yr for realistically estimated frequencies).

Risk assessment results are summarized in Table A-1 for SNM (Pu metal and oxide), Table A-2 for Pu residue drums, Table A-3 for liquid residues, Table A-4 for high concentration liquids, and Table A-5 for TRU wastes. The frequencies differ based on the number of miles or other qualitative adjustments as described earlier. Radiological consequences are presented in terms of 50-year committed effective dose equivalent (CEDE) based on current AB methods (e.g., conservative assumptions such as 95 percentile dispersion).

Scenario 1 is a credible accident but results in no releases, due to a damage ratio of zero for low accident speeds. Therefore, it is not further mentioned in the following summary of risk assessment results.

Table A-1 shows that for on-site SNM transfers, two accidents are considered credible (Scenarios 2 and 8) and four accidents were determined to be *Incredible* (Scenarios 3, 4, 5, and 6) or not applicable ("N/A" Scenario 7). All credible accidents have a frequency class of *Extremely Unlikely*. For the credible accidents, Maximum Offsite Individual doses are all *Moderate*, ranging from 0.28 rem for the minor spill to 2.8 rem for the drum pyrophoric fire and resulting in Risk Class III accidents for public risk, per DOE Standard 3011. Collocated worker consequences are all *High* for credible accidents, ranging from 28 rem for minor spill to 280 rem for the drum pyrophoric fire and resulting in Risk Class II scenarios for the collocated worker. Considering the *Incredible* accidents, consequences re *Moderate* to *High* for the public (up to 28 rem) resulting in Risk Classes III to II, and consequences are *High* for the collocated worker (up to 2,800 rem) resulting in Risk Class II. These risk results are consistent with Site AB results for dock and unfiltered building accidents.

Table A-2 shows that for on-site Pu residue transfers, four accidents are considered (Scenarios 2, 3, 7 and 8) credible and the remaining three accidents were determined to be *Incredible* (Scenarios 4, 5 and 6). All credible accidents have a frequency class of *Extremely Unlikely*. For the credible accidents, Maximum Offsite Individual doses are *Low* for the minor spill, and *Moderate* for all others (ranging up to 0.8 rem for the drum pyrophoric fire), resulting in either Risk Class III or Risk Class IV for public risk. Collocated worker consequences are *Moderate* to *High* for the credible accidents (ranging up to 80 rem for the drum pyrophoric fire), resulting in a collocated worker Risk Class II for two scenarios (medium spill and pyrophoric fire) and Risk Class III for the others. Considering the *Incredible* accidents, consequences are *Moderate* for the public (up to 3.7 rem) and *High* (up to 367 rem) for the collocated worker, resulting in Risk Classes III and II, respectively.

Table A-1. Risk Associated with On-site Transfer of Pu Metal and Oxide

Scenario	Frequency	Maximum Offsite Individual		Collocated Worker	
		Consequences	Risk Class (Risk in rem/yr)	Consequences	Risk Class
1 - Truck Accident With No Release	Extremely Unlikely (1.7E-5/yr)	NA	NA	NA	NA
2 - Truck Accident Resulting in Minor Spill	Extremely Unlikely (4.1E-6/yr)	Moderate (0.28 rem)	III (1.1E-6)	High (28 rem)	II
3 - Truck Accident Resulting in Medium Spill	Incredible (4.3E-7/yr)	Moderate (2.8 rem)	III (1.2E-6)	High (280 rem)	II
4 - Truck Accident Resulting in Major Spill	Incredible (8.9E-8/yr)	High (28 rem)	II (2.5E-6)	High (2800 rem)	II
5 - Truck Accident Resulting in Fire	Incredible (3.1E-10/yr)	High (14 rem)	II (4.4E-9)	High (490 rem)	II

6 - Vehicle Fire Spreads and Involves Drums	Incredible (1.2E-8/yr)	Moderate (0.84 rem)	III (1.0E-8)	High (29 rem)	II
7 - Drum Ruptures Due to Hydrogen Buildup/Ignition	N/A	N/A	N/A	N/A	N/A
8 - Movement Disturbs Reactive or Pyrophoric Material Resulting in Fire	Extremely Unlikely (1.0E-4/yr)	Moderate (2.8 rem)	III (2.8E-4)	High (280 rem)	II
SNM Risk			(2.8E-4)		

Table A-2. Risk Associated with On-site Transfer of Pu Residues

Scenario	Frequency	Maximum Offsite Individual		Collocated Worker	
		Consequences	Risk Class (Risk in rem/yr)	Consequences	Risk Class
1 – Truck Accident With No Release	Extremely Unlikely (8.6E-5/yr)	NA	NA	NA	NA
2 – Truck Accident Resulting in Minor Spill	Extremely Unlikely (2.0E-5/yr)	Low (0.037 rem)	IV (7.5E-7)	Moderate (3.7 rem)	III
3 – Truck Accident Resulting in Medium Spill	Extremely Unlikely (2.2E-6/yr)	Moderate (0.37 rem)	III (7.9E-7)	High (37 rem)	II
4 – Truck Accident Resulting in Major Spill	Incredible (4.4E-7/yr)	Moderate (3.7 rem)	III (1.6E-6)	High (367 rem)	II
5 – Truck Accident Resulting in Fire	Incredible (1.6E-9/yr)	Moderate (1.6 rem)	III (2.9E-9)	High (65 rem)	II
6 – Vehicle Fire Spreads and Involves Drums	Incredible (6.2E-8/yr)	Moderate (0.24 rem)	III (1.5E-8)	Moderate (8.4 rem)	III
7 – Drum Ruptures Due to Hydrogen Buildup/Ignition	Extremely Unlikely (8.0E-5/yr)	Moderate (0.16 rem)	III (1.3E-5)	Moderate (16 rem)	III
8 – Movement Disturbs Reactive or Pyrophoric Material Resulting in Fire	Extremely Unlikely (1.0E-4/yr)	Moderate (0.8 rem)	III (8.0E-5)	High (80 rem)	II
Residue Risk			(9.6E-5)		

Table A-3 shows that for on-site Pu residue transfers of liquids, two accidents are considered credible (Scenarios 2 and 7) and the remaining five accidents were determined to be *Incredible* (Scenarios 3, 4, 5 and 6) or not applicable (Scenario 8). All credible accidents have a frequency class of *Extremely Unlikely*. For the credible accidents, Maximum Offsite Individual doses are *Low*, resulting in Risk Class IV for public risk. Collocated-worker consequences are *Moderate* for the credible accidents (ranging up to 3.2 rem for the drum explosion), resulting in a collocated worker Risk Class III. Considering the *Incredible* accidents, consequences are *Moderate* for the public (up to 3.2 rem) and *High* (up to 112 rem) for the collocated worker, resulting in Risk Classes III and II, respectively.

Table A-3. Risk Associated with On-site Transfer of Pu Liquids

Scenario	Frequency	Maximum Offsite Individual		Collocated Worker	
		Consequences	Risk Class (Risk in rem/yr)	Consequences	Risk Class

1 – Truck Accident With No Release	Extremely Unlikely (8.6E-6/yr)	NA	NA	NA	NA
2 – Truck Accident Resulting in Minor Spill	Extremely Unlikely (2.0E-6/yr)	Low (0.006 rem)	IV (1.3E-8)	Moderate (0.64 rem)	III
3 – Truck Accident Resulting in Medium Spill	Incredible (2.2E-7/yr)	Low (0.064 rem)	IV (1.4E-8)	Moderate (6.4 rem)	III
4 – Truck Accident Resulting in Major Spill	Incredible (4.4E-8/yr)	Moderate (0.64 rem)	III (2.8E-8)	High (64 rem)	II
5 – Truck Accident Resulting in Fire	Incredible (1.6E-10/yr)	Moderate (3.2 rem)	III (5.0E-10)	High (112 rem)	II
6 – Vehicle Fire Spreads and Involves Drums	Incredible (6.3E-9/yr)	Moderate (0.19 rem)	III (1.2E-9)	Moderate (6.7 rem)	III
7 – Drum Ruptures Due to Hydrogen Buildup/Ignition	Extremely Unlikely (1.2E-5/yr)	Low (0.032 rem)	IV (3.8E-7)	Moderate (3.2 rem)	III
8 – Movement Disturbs Reactive or Pyrophoric Material Resulting in Fire	N/A	N/A	N/A	N/A	N/A
Pu Liquid Risk			(4.4E-7)		

Table A-4 shows that for on-site Pu residue transfers of high concentration liquids, no accidents are considered credible. Consequences are *Moderate* for the public (up to 1.9 rem) and *High* (up to 67 rem) for the collocated worker, resulting in Risk Classes III and II, respectively.

Table A-4. Risk Associated with On-site Transfer of Pu High Concentration Liquids

Scenario	Frequency	Maximum Offsite Individual		Collocated Worker	
		Consequences	Risk Class (Risk in rem/yr)	Consequences	Risk Class
1 - Truck Accident With No Release	Extremely Unlikely (1.7E-6/yr)	NA	NA	NA	NA
2 - Truck Accident Resulting in Minor Spill	Incredible (4.1E-7/yr)	Low (0.004 rem)	IV (1.6E-9)	Low (0.38 rem)	IV
3 - Truck Accident Resulting in Medium Spill	Incredible (4.5E-8/yr)	Low (0.038 rem)	IV (1.7E-9)	Moderate (3.8 rem)	III
4 - Truck Accident Resulting in Major Spill	Incredible (8.9E-9/yr)	Moderate (0.38 rem)	III (3.4E-9)	High (38 rem)	II
5 - Truck Accident Resulting in Fire	Incredible (3.1E-11/yr)	Moderate (1.9 rem)	III (6.0E-11)	High (67 rem)	II
6 - Vehicle Fire Spreads and Involves Drums	Incredible (1.5E-9/yr)	Moderate (0.97 rem)	III (1.5E-9)	High (34 rem)	II
7 - Drum Ruptures Due to Hydrogen Buildup/Ignition	Incredible (4.8E-7/yr)	Moderate (0.16 rem)	III (7.7E-8)	Moderate (16 rem)	III
8 - Movement Disturbs Reactive or Pyrophoric	N/A	N/A	N/A	N/A	N/A

Material Resulting in Fire					
Pu High-Conc. Liquid Risk			(8.5E-8)		

Table A-5 shows that for on-site transfers of TRU waste, four accidents are considered credible (Scenarios 2, 3, 7 and 8) and the remaining three accidents were determined to be *Incredible* (Scenarios 4, 5 and 6). All credible accidents have a frequency class of *Extremely Unlikely*. For the credible accidents, Maximum Offsite Individual doses range from *Low* to *Moderate* (up to 0.26 rem for pyrophoric or reactive fire) resulting in Risk Class IV or III for public risk. Collocated worker consequences range from *Moderate* to *High* (up to 26 rem for pyrophoric or reactive fire) for the credible accidents, resulting in collocated worker Risk Classes of III and II. Considering the *Incredible* accidents, consequences are *Moderate* for the public (up to 1.0 rem) and *High* (up to 102 rem) for the collocated worker, resulting in Risk Classes III and II, respectively.

LLW risk assessment results are not summarized but result in Risk Class III or IV to the collocated worker and Risk Class IV to the public due to *Low* consequence ratings for all accidents.

Table A-5. Risk Associated with On-site Transfer of TRU Wastes

Scenario	Frequency	Maximum Offsite Individual		Collocated Worker	
		Consequences	Risk Class (Risk in rem/yr)	Consequences	Risk Class
1 – Truck Accident With No Release	Unlikely (1.2E-4/yr)	NA	NA	NA	NA
2 – Truck Accident Resulting in Minor Spill	Extremely Unlikely (2.8E-5/yr)	Low (0.01 rem)	IV (4.0E-7)	Moderate (1.0 rem)	III
3 – Truck Accident Resulting in Medium Spill	Extremely Unlikely (3.0E-6/yr)	Moderate (0.1 rem)	III (4.3E-7)	Moderate (10 rem)	III
4 – Truck Accident Resulting in Major Spill	Incredible (6.2E-7/yr)	Moderate (1.0 rem)	III (8.8E-7)	High (102 rem)	II
5 – Truck Accident Resulting in Fire	Incredible (2.2E-9/yr)	Moderate (0.52 rem)	III (1.5E-9)	Moderate (18 rem)	III
6 – Vehicle Fire Spreads and Involves 3 Drums	Incredible (2.5E-8/yr)	Moderate (0.048 rem)	IV (3.8E-9)	Moderate (1.7 rem)	III
7 – Box Ruptures Due to Hydrogen Buildup/Ignition	Extremely Unlikely (1.0E-4/yr)	Low (0.077 rem)	IV (7.6E-6)	Moderate (7.7 rem)	III
8 – Movement Disturbs Reactive or Pyrophoric Material Resulting in Fire	Extremely Unlikely (1.0E-4/yr)	Moderate (0.26 rem)	III (4.2E-5)	High (26 rem)	II
TRU (drums & boxes) Risk			(5.1E-5)		
LLW (drums & crates) Risk			(1.4E-8)		

The controls and features that are credited to prevent or mitigate credible accidents, or conclude that the scenario is *Incredible* are summarized in Table A-6. Table A-6 also summarizes other transportation controls that are not specifically credited in the safety analysis but provide defense in depth. The Site SAR makes a distinction of credited controls versus defense-in-depth controls in Tables 8-46 through 8-52 in Section 8.10, "Operational Controls". However, the Site SAR requires that both types of controls are to be complied with and discusses the

process for dispositioning non-compliances (i.e., individual deficiencies) and programmatic breakdown (i.e., a violation of the controls). The controls listed in Section 8.10 should be moved to the Site SAR Chapter 7 to facilitate centralizing the AB controls being relied upon to minimize risk (see DOE technical direction in Appendix B).

Table A-6. Transportation Controls to Prevent or Mitigate Accidents

Preventive or Mitigative Control	Reference Document	Potential TSR	Credited in Safety Analysis							
			Scenario 1 No Release	Scenario 2 Minor Spill	Scenario 3 Medium Spill	Scenario 4 Major Spill	Scenario 5 Fire from Collision	Scenario 6 Vehicle Fire	Scenario 7 H2 Explosion	Scenario 8 Pyrophoric Fire
Transportation vehicles carrying Type A containers shall not exceed speeds of 15 mph as indicated on the vehicle speedometer, except as directed during security situations	Procedure 4-T66-TSO-001 (CAT-I & II), 4-T67-TSO-003 (CAT-III & IV)	√	√	√	√	√	√	N/A	N/A	N/A
25 mph speed limit within Protected Area for all except emergency vehicles	1-T93-Traffic-110	√	√	√	√	√	√	N/A	N/A	N/A
Approved containers equivalent to DOT Type A (or better)	1-T93-Traffic-110	√	√	√	√	√	√	√	√	√
Waste container specifications and packaging procedure. Verification before transfer of container integrity.	1-M12-WO-4034 and 4-D99-WO-1100	√	√	√	√	√	√	√	√	√
Drum tie-downs on truck	1-T93-Traffic-110	√	√	√	√	√	√	N/A	N/A	N/A
TSO present to control movements	Procedure 4-T66-TSO-001 (CAT-I & II), 4-T67-TSO-003 (CAT-III & IV)	√	√	√	√	√	√	√	N/A	N/A
Radio communication	Procedure 4-T66-TSO-001 (CAT-I & II), 4-T67-TSO-003 (CAT-III & IV)	√	√	√	√	√	√	√	N/A	N/A
Truck design features (e.g., steel bed)		√					√	√	N/A	N/A

Preventive or Mitigative Control	Reference Document	Potential TSR	Credited in Safety Analysis							
			Scenario 1 No Release	Scenario 2 Minor Spill	Scenario 3 Medium Spill	Scenario 4 Major Spill	Scenario 5 Fire from Collision	Scenario 6 Vehicle Fire	Scenario 7 H2 Explosion	Scenario 8 Pyrophoric Fire
No combustibles on truck	Procedure 4-T66-TSO-001 (CAT-I & II), 4-T67-TSO-003 (CAT-III & IV)	√	N/A	N/A	N/A	N/A	√	√	N/A	N/A
TSO verifies that transient combustible materials are not allowed within five feet of the transportation vehicle while loading salt residue drums onto the truck.	Procedure 4-T66-TSO-001 (CAT-I & II), 4-T67-TSO-003 (CAT-III & IV)	√	N/A	N/A	N/A	N/A	√	√	N/A	N/A
DOE Direction: Have TSO verify that transient combustible materials are not allowed within five feet of the transportation vehicle while loading drums > 200 g equivalent WG Pu onto the truck.		√	N/A	N/A	N/A	N/A	√	√	N/A	N/A
TSO verifies that no spark/flame/heat producing work or smoking is allowed on the dock or in the vicinity of the truck when loading salt residue drums onto the truck.	Procedure 4-T66-TSO-001 (CAT-I & II), 4-T67-TSO-003 (CAT-III & IV)	√	N/A	N/A	N/A	N/A	N/A	√	N/A	N/A
DOE Direction: Have TSO verify that no spark/flame/heat producing work or smoking is allowed on the dock or in the vicinity of the truck when loading drums > 200 g equivalent WG Pu onto the truck.		√	N/A	N/A	N/A	N/A	N/A	√	N/A	N/A

Preventive or Mitigative Control	Reference Document	Potential TSR	Credited in Safety Analysis							
			Scenario 1 No Release	Scenario 2 Minor Spill	Scenario 3 Medium Spill	Scenario 4 Major Spill	Scenario 5 Fire from Collision	Scenario 6 Vehicle Fire	Scenario 7 H2 Explosion	Scenario 8 Pyrophoric Fire
TSO verifies that no flammable liquids are allowed on the dock or in the vicinity of the transportation truck while loading or transporting salt residue drums.	Procedure 4-T66-TSO-001 (CAT-I & II), 4-T67-TSO-003 (CAT-III & IV)	√	N/A	N/A	N/A	N/A	N/A	√	N/A	N/A
DOE Direction: Have TSO verify that no flammable liquids are allowed on the dock or in the vicinity of the transportation truck while loading or transporting drums> 200 g equivalent WG Pu.		√	N/A	N/A	N/A	N/A	N/A	√	N/A	N/A
During loading and unloading, all shipping containers greater than 200 g equivalent WG Pu shall be continuously attended as long as they are not protected by a building's ventilation and filtration system.	Building procedures and revision to building TSRs/OSRs	√	N/A	N/A	N/A	N/A	N/A	√	N/A	N/A
Turn engines off at the dock	Procedure 4-T66-TSO-001 (CAT-I & II), 4-T67-TSO-003 (CAT-III & IV)	√	N/A	N/A	N/A	N/A	N/A	√	N/A	N/A
Fire Department response		√	N/A	N/A	N/A	N/A	√	√		
Drum venting and inspection program		√	N/A	N/A	N/A	N/A	N/A	N/A	√	N/A
Vehicle safety inspections	1-T93-Traffic-110		√	√	√	√	√	√	N/A	N/A

Preventive or Mitigative Control	Reference Document	Potential TSR	Credited in Safety Analysis							
			Scenario 1 No Release	Scenario 2 Minor Spill	Scenario 3 Medium Spill	Scenario 4 Major Spill	Scenario 5 Fire from Collision	Scenario 6 Vehicle Fire	Scenario 7 H2 Explosion	Scenario 8 Pyrophoric Fire
No shipping during severe weather	Procedure 4-T66-TSO-001 (CAT-I & II), 4-T67-TSO-003 (CAT-III & IV), Wackenhut 3-5540		√	√	√	√	√	N/A	N/A	N/A
Delay transfer until after scheduled security drills or if security or emergency response is in progress	Wackenhut 3-5540		√	√	√	√	√	N/A	N/A	N/A
Portable fire extinguishers on trucks	1-T93-Traffic-110		N/A	N/A	N/A	N/A	N/A	√	N/A	N/A
TSO consider stopping the CAT-III or IV transfer vehicle if a security or Fire Department response occurs within the Protected Area.	4-T67-TSO-003 (CAT-III & IV)		√	√	√	√	√	N/A	N/A	N/A
Convoy Commander consider appropriate actions for CAT-I or II transfer vehicle if a security or Fire Department response occurs within the Protected Area.	Wackenhut 3-5540		√	√	√	√	√	N/A	N/A	N/A
Category I & II escorts and road blockages	Wackenhut 3-5540		√	√	√	√	√	N/A	N/A	N/A
Verify receiving facility ready to minimize delays at the dock	Procedure 4-T66-TSO-001 (CAT-I & II), 4-T67-TSO-003 (CAT-III & IV)		N/A	N/A	N/A	N/A	N/A	√	√	√
No staging of drums in trucks	Safeguards and Security Manual		N/A	N/A	N/A	N/A	N/A	√	√	√

Preventive or Mitigative Control	Reference Document	Potential USR	Credited in Safety Analysis							
			Scenario 1 No Release	Scenario 2 Minor Spill	Scenario 3 Medium Spill	Scenario 4 Major Spill	Scenario 5 Fire from Collision	Scenario 6 Vehicle Fire	Scenario 7 H_2 Explosion	Scenario 8 Pyrophoric Fire
Pyrophoric material transfer packaging and procedure	HSP/FLP 31.11		N/A	N/A	N/A	N/A	N/A	N/A	N/A	√
Nuclear criticality safety program	Interim Nuclear Safety Manual for Intraplant Shipment	√	Credited to meet double contingency principle, but potential extremely unlikely scenarios have not been evaluated. Also used to establish bounding material-at-risk assumptions for packages, e.g., 1 kg WG Pu/drum or 5 kg Pu oxide/drum.							
Fuel delivery vehicles are prohibited from using the same route as the transfer vehicles during a material transfer.	Recommended by Site SAR risk assessment		Credited control to eliminate potential explosions in the vicinity of the transport vehicle.							
Propane-powered transport vehicles are prohibited.	Recommended by Site SAR Risk Assessment		Credited control to eliminate potential explosions in the vicinity of the transport vehicle.							
Fuel transfers (e.g., filling of propane or gasoline tanks) are prohibited in the vicinity of a dock during loading and unloading operations.	Recommended by Site SAR risk assessment		Credited control to eliminate potential explosions in the vicinity of the transport vehicle.							
DOE Directions to Consider Additional Controls (from salt transportation assessment, but applicable to SNM and average residue transfers)										
Consider mandatory use of proposed Pipe Overpack Component (POC) for outgoing stabilized dispersible residues (i.e., primary container inside a pipe containment vessel inside a lined 55-gallon drum). This practice was adopted.		√	√	√	√	√	√	√	N/A	N/A
Reduce residue shipment inventory to less than Category II			N/A	Would reduce consequences by about 40% or a factor of 1.6					N/A	N/A
Schedule SNM and residue shipments to minimize total mileage, thus lowering the likelihood of a transportation accident.			√	√	√	√	√	√	√	√

(√) Indicates "Yes"; a blank indicates "No" or "not specifically credited" but may provide defense-in-depth; and "N/A" is "not applicable" to the scenario.

A.4 DOE APPROVAL BASES

While on-site transportation activities have been conducted and controlled by the Site Transportation Manual and Transportation Committee, the Site SAR risk assessment concludes that the on-site transportation program does not ensure that the transport system will prevent loss of containment for all credible on-site accidents. Transportation activities are comparable in risk to site operational risks involving unfiltered releases from the dock. Therefore, formal DOE review and approval of Site transportation risk and controls are required under DOE Order 5480.23. DOE's approval of the Transportation Manual focused on meeting DOT requirements (or their equivalencies) and security aspects of the Manual, and not on the nuclear safety risk and controls to prevent or mitigate accidents. The Site SAR transportation risk assessment provides a thorough analysis of the risks associated with on-site transfers and identifies several controls that have been or will be formalized into local procedures. Therefore, the controls identified in Table A-6, which are from the Site SAR Chapter 8 and supporting calculations, the Site Transportation Manual, and the additional DOE technical direction listed in Appendices B and D, form a bases for approving on-site transportation of SNM, non-americium-enhanced residues, TRU waste, LLW, hazardous chemicals, and fuels. These controls are consistent with those identified in the salt transportation risk assessment and previous DOE technical direction. With the additional reliance on the NSTR risk assessment for salt transportation (which should be added to the Authorization Basis Document List until the Site SAR is updated; see DOE technical direction in Appendix D), all on-site transportation of radioactive materials will have an AB.

As with the salt transportation risk assessment, one conclusion of this Site SAR risk assessment that can be generally drawn are that major accidents resulting in spills and fires from transportation vehicles (i.e., Scenarios 4, 5 and 6 for all radioactive material transfers) are *Incredible*. However, for residue (solid and liquid) and TRU waste transfers, the medium spill (Scenarios 3) is credible due to the greater number of transfers. The Site SAR risk assessment concludes from a review of NUREG-0170 that accidents involving vehicle speeds of 11mph or less result in no release from containers (Scenario 1). The Site SAR risk assessment applies engineering judgment to increase this speed to 15 mph to allow credit for tiedowns. The general traffic speed limit is 15 mph within the PA, and 25 mph elsewhere on site. By analyzing accidents of greater than 15 mph, the Site SAR risk assessment considers vehicles that could be conducting emergency fire or security response or would be speeding in violation of the 15 or 25 mph speed limits. The specified credit for lower accident frequencies for on-site transportation implicitly includes emergency response accidents that occurred at other DOE sites. DOE concurs with the generalized conclusion that major accidents involving spills and fires are not credible for on-site transportation. The controls already identified along with the additional DOE directed controls are considered adequate for the credible Scenario 2 (minor spill) and Scenario 3 (medium spill) for all radioactive material transfers, including salts.

Scenario 7 is a single drum accident involving an explosion. Drum explosions due to hydrogen generation are estimated to be *Extremely Unlikely* events. The Site SAR risk assessment asserts that this estimation does not credit 55 gallon drum venting (i.e., installation of HEPA filtered lids), nor the vent surveillance program for residue drums, which are claimed to only provide defense-in-depth. However, the control to provide a HEPA filtered-lid is required as a credited control in recently approved AB documents because DOE believes that the frequency of an explosion would be higher without this control, e.g., an *Unlikely* event (and the recently instituted vent surveillance program for residue drums would be defense in depth). Although incidents have occurred within the DOE complex involving an explosion and causing a drum lid failure during transportation, the drum filters lessen this likelihood such that it is a low probability accident (see DOE technical direction in Appendix D). TRU waste drum vents are not required to be inspected and therefore could plug without detection. However, the WIPP head-space gas sampling program has evaluated a large number of drums and results show that except for cemented sludges, elevated levels of hydrogen gas are associated with oxygen depletion such that an explosion cannot occur.

Scenario 8 is also a single drum accident involving a pyrophoric fire. Pyrophoric drum fires address the possibility of disturbing a drum such that material comes in contact with oxygen or contains potential reactive material. This scenario is also estimated to be *Extremely Unlikely*.

Both Scenarios 7 and 8 are postulations of remote accidents, with conservative estimation of consequences, presented for risk completeness. While they cannot be precluded as *Incredible*, the existing programs provide preventative controls (including packaging and HSP 31.11) as summarized in Table A-6.

For comparison purposes, Table A-7 summarizes the salt transportation risk assessment. As expected based on the amount of MAR, the salt transportation risks are greater than other average residues, and almost the same magnitude as those risks associated with SNM transfers involving oxides.

Table A-7. Risk Associated with On-site Transfer of Salt Residues

Scenario	Frequency	Maximum Offsite Individual		Collocated Worker	
		Consequences	Risk Class (Risk in rem/yr)	Consequences	Risk Class
1 – Truck Accident With No Release	Extremely Unlikely (9.9E-6yr)	NA	NA	NA	NA
2 – Truck Accident Resulting in Minor Spill	Extremely Unlikely (2.4E-6/yr)	Moderate (0.28 rem)	III (6.7E-7)	High (28 rem)	II
3 – Truck Accident Resulting in Medium Spill	Incredible (2.5E-7/yr)	Moderate (2.8 rem)	III (7.0E-7)	High (280 rem)	II
4 – Truck Accident Resulting in Major Spill	Incredible (5.2E-8/yr)	High (28 rem)	II (1.5E-6)	High (2800 rem)	II
5 – Truck Accident Resulting in Fire	Incredible (3.6E-9/yr)	Moderate (4.7 rem)	III (1.7E-8)	High (160 rem)	II
6 – Vehicle Fire Spreads and Involves Drums	Incredible (5.0E-7/yr)	Moderate (0.8 rem)	III (4.0E-7)	High (26 rem)	II
7 – Drum Ruptures Due to Hydrogen Buildup/Ignition	Extremely Unlikely (2.8E-6/yr)	Moderate (0.8 rem)	III (2.2E-6)	High (77 rem)	II
8 – Movement Disturbs Reactive or Pyrophoric Material Resulting in Fire	Extremely Unlikely (1E-6/yr)[1]	Moderate (3.8 rem)	III (3.8E-6)	High (380 rem)	II
Salt Risk			(9.3E-6)		

[1]Lower end of frequency bin assumed because most salts were excluded from the Site's HSP 31.11 procedure on pyrophoric Pu storage and handling – still accounts for approximately 40% of salt transportation risks.

Since consequences of salt accidents are similar to those from Pu oxide, their frequency of occurrences can be combined[2] to determine if the risk classes would increase. Table A-8 shows that there is no change in frequency classes, and therefore there is no increase in risk classes for all scenarios. For future unreviewed safety question determinations (USQDs) of proposed changes or discovery issues, the combined frequency (and risk classes) for SNM and salt residues on-site transfers should be used to determine if there is a potential change in frequency (see DOE technical direction in Appendix D). Since consequences from average residue on-site transfer accidents are approximately one order of magnitude less than Pu oxides and salt residues, their frequencies (and lower risk classes) should not be combined for future USQD purposes, nor should they be combined with the frequencies for liquid residues, high concentration liquids, or TRU waste.

[2] Quantitative risk assessment methodologies allow summing the frequencies of similar-consequence accidents because the sum of their individual risks (i.e., frequency times consequence for each accident type) is the same, but the frequencies of significantly different consequence accidents cannot be summed because the sum of their individual risks is different.

Table A-8. Risk Associated with On-site Transfer of Pu Metal, Oxides, and Salt Residues

Scenario	Frequency	Maximum Offsite Individual		Collocated Worker	
		Consequences	Risk Class (Risk in rem/yr)	Consequences	Risk Class
1 – Truck Accident With No Release	Extremely Unlikely (2.7E-5yr)	NA	NA	NA	NA
2 – Truck Accident Resulting in Minor Spill	Extremely Unlikely (6.5E-6/yr)	Moderate (0.28 rem)	III (1.8E-6)	High (28 rem)	II
3 – Truck Accident Resulting in Medium Spill	Incredible (6.8E-7/yr)	Moderate (2.8 rem)	III (1.9E-6)	High (280 rem)	II
4 – Truck Accident Resulting in Major Spill	Incredible (1.4E-7/yr)	High (28 rem)	II (3.9E-6)	High (2800 rem)	II
5 – Truck Accident Resulting in Fire	Incredible (3.9E-9/yr)	Moderate (4.7 rem [salts]) High (14 rem [oxide])	III (1.7E-8) II (4.4E-9)	High (160 to 490 rem)	II
6 – Vehicle Fire Spreads and Involves Drums	Incredible (5.1E-7/yr)	Moderate (0.8 rem)	III (4.1E-8)	High (26 to 29 rem)	II
7 – Drum Ruptures Due to Hydrogen Buildup/Ignition	Extremely Unlikely (2.8E-6/yr) [N/A for oxides]	Moderate (0.8 rem)	III (2.2E-6)	High (77 rem)	II
8 – Movement Disturbs Reactive or Pyrophoric Material Resulting in Fire	Extremely Unlikely (1.0E-4/yr)	Moderate (2.8 to 3.8 rem)	III (2.8E-4) (3.8E-6)	High (280 to 380 rem)	II
SNM & Salt Risk			(2.9E-4)		

A summary of on-site transportation risk of all radioactive material transfers including salts is presented in Table A-9. The Site composite risk for on-site transportation is 4.4E-4 rem/yr for the MOI, based on 95th percentile dispersion. This can be compared to the AB seismic risk estimate of 1.9E-1 rem/yr as presented in Section 2 Table 2-8. SNM (Pu metals and oxides) dominate on-site transportation risks, comprising 64% of the total. The next largest contributor is Pu residue transfers at 22%, followed by TRU waste transfers at 12%. Pu salt, Pu liquid, and LLW are insignificant contributors to on-site transportation risks.

In addition to this AB conservative estimate of on-site transportation risks, the Site SAR Chapter 8 presents a more realistic estimate of risk based on median weather dispersion that is approximately 5E-5 rem/yr for all scenarios evaluated. This median risk estimate can also be compared to the median risk estimates presented in the Site SAR Chapter 9. For example, the Site SAR Table 9-17 risk estimate of 5.6E-2 rem/yr for a Peak Closure case, or the revised 1998 risk estimate of 4.6E-2 rem/yr as shown in Section 2 Table 2-7, would not significantly change by adding in the on-site transportation risk.

Table A-9. On-site Transportation Risk Summary

Transportation Activity	MOI Risk (rem/yr)	% Contribution
SNM Metals & Oxides	2.8E-4	64%
Pu Salts	9.3E-6	2%
Pu Residues	9.6E-5	22%
Pu Liquids	4.4E-7	< 1%
Pu High-Conc. Liquids	8.5E-8	< 1%
TRU (drums and boxes)	5.1E-5	12%
LLW (drums and crates)	1.4E-8	< 1%
Site composite transportation risk	4.4E-4	100%

The Site SAR also evaluates on-site transportation of hazardous chemicals (K-H 1998c), flammable or combustible fuels and some offsite events (e.g., chemical spills or gas explosions) to assess on-site impacts (K-H 1998d). These risk assessments do not evaluate the same eight accident types and apply different methodologies. General comments and concerns are discussed next:

- The risk assessment of hazardous chemical on-site transportation (as documented in Section 8.7 and CALC-RFP-98.0660-MAN) was not reviewed in detail but appears to adequately address large quantity hazardous chemical accidents in order to identify appropriate controls in Section 8.10.2. The consequence assessment is consistent with 40 CFR 68 requirements for evaluating a worst case scenario, and results are based on the ALOHA model also used for emergency planning. However, the hazardous chemical risk assessment only evaluates one scenario based on the frequency methodology applied for the radiological risk assessment. This is Scenario 5 involving a 55 mph crash. The probability of Scenario 6 involving a crash and subsequent fire is approximately a factor of 5 higher. Also, the source term based on the fuel fire heating a non-volatile chemical could result in higher consequences than evaluated. These issues should be dispositioned for the next annual update (see DOE technical direction in Appendix C).

- The fuels risk assessment (Section 8.8 and CALC-RFP-98.0717-KKK) was not reviewed in detail but appears to adequately address flammable and combustible fuel accidents in order to identify appropriate controls in Section 8.10.3. The frequencies are based on more recent transportation risk assessments than NUREG-0170. The consequence descriptions presented in Tables 8-40, 8-41, and 8-42 are not based on the *High/Moderate/Low* levels as used for other BIO-type risk assessments. Consider whether these consequence levels could be established to provide perspectives on the magnitude of potential consequences (see DOE technical direction in Appendix C). Toxicological consequences for combustible fuels are evaluated with the ALOHA model.

- The offsite transportation risk assessment (Section 8.9 and CALC-RFP-98.0717-KKK) was not reviewed in detail but appears to adequately address the potential on-site impacts from offsite transportation accidents involving hazardous chemicals in order to identify appropriate controls in Section 8.10.4. The impact of offsite flammable gas or liquid accidents would be bounded by the on-site risk assessment of fuels.

In summary, except as identified and addressed as DOE technical direction in Appendices B, C, and D, RFFO concurs with the risk assessment, identified controls (including the ones identified in Table A-6), and conclusions for on-site transfers of SNM, residues (solid and liquid), TRU, LLW, hazardous chemicals, and fuels. This Site SAR risk assessment, and the previous risk assessment for salt transportation, provide an accident analysis which can be used for future USQDs of proposed changes or discovery issues (see Section 2.1.f USQD Considerations). Together, the two risk assessments establish a defensible accident analysis where none existed before.

A5. DISCUSSION OF SIGNIFICANT ISSUES

The following is a discussion of the significant issues based on review of the Site SAR on-site transportation analysis and relevant Salt transportation analysis technical issues that still apply. These issues are more concisely identified in DOE technical direction provided in Appendix B as part of approval, in Appendix C to be addressed at the next annual update, or Appendix D to be addressed during implementation.

A. For pickup and delivery, a step was added for the TSO to ensure that the following controls have been implemented by the building (note: this was only added for salt transportation, not all residues, SNM or high-Am TRU wastes greater than 200 g equivalent WG Pu – see DOE technical direction in Appendix B):

- Transient combustible materials are not allowed within five feet of the transportation vehicle while loading/unloading drums onto/off the truck.
- No spark/flame/heat producing work or smoking is allowed on the dock or in the vicinity of the truck when loading/unloading drums onto/off the truck.
- No flammable liquids, except in approved containers, are allowed on the dock or in the vicinity of the transportation truck while loading/unloading.
- Shipping containers with more than 200 grams plutonium equivalent will be attended at all times while they are located within an unfiltered area. (Facility procedures were revised or created to implement this 200 gram control. Facility AB's need to be revised to credit this control in their hazards and accident analysis and to propose TSRs.)

B. Whenever practical, the contractor was directed to consider reducing the shipment inventories of salts residues (which would also apply to the average residue transfers) to less than Category II shipments. This would reduce the potential radiological consequences to the MOI and collocated workers (in addition to the cost savings by eliminating security escorts). In response to the salt transportation DOE technical direction, the contractor contends that the overall risk is not reduced by the reduction in MAR due to the increase in frequency that occurs due to additional transfers. Although RFFO concurs with this from an overall probabilistic risk assessment approach (i.e., establishing a composite risk value by summing all branches of an event tree analysis), there still are advantages to reducing the potential *High* consequences to the collocated worker or public by limiting MAR, even if the reduction is not sufficient to lower the qualitative consequence level class (i.e., this would reduce some of the *High* consequences that exceed 25 rem to the collocated worker or 5 rem to the MOI to a more acceptable level). If reductions can be achieved to reduce consequences to a lower level (e.g., from *High* to *Moderate*), based on the DOE Standard 3011 Preliminary Hazards Analysis qualitative risk assessment approach, risk would be reduced to Risk Class III because the increase in quantitative frequency estimates should not be sufficient to cause an increase in the qualitative frequency bin assignment (i.e., do not expect the *Extremely Unlikely* scenarios to become *Unlikely*). (See DOE technical direction in Appendix D.)

C. The Site SAR risk assessment assumes a 0.1% probability that a fire will breach the metal truck bed before the Fire Department can extinguish the fire (i.e., the Fire Department will be successful 999 times out of 1,000 truck fires which is a factor of 10 better than the assumption used for the 1987 FSAR probabilistic risk assessments). This is a factor of 20 lower than the 2% probability assumed for the salt transportation risk assessment. This change in assumption is justified on page 8-28 based on multiplying three frequencies per year together which is not mathematically correct (i.e., cannot multiply frequencies, only unitless probabilities with or without one initiating event frequency per year). RFFO does not concur with this change – the risk assessment should be revised to reflect the higher frequencies for all Scenarios 5 and 6 based on the previously RFFO-accepted 2% probability. It appears that only one Scenario 6 for average residues will change from *Incredible* to *Extremely Unlikely*. (See DOE technical direction in Appendix C).

D. The consequences of a criticality accident are presented in the Site SAR, however, it's probability and risks are not presented. The Site SAR stated that criticality accidents are not analyzed in the risk assessment because they are analyzed in the Criticality Safety Evaluations (CSE) supporting the nuclear material safety limits for on-site transportation. The CSEs have evaluated transportation accidents involving radioactive materials and have concluded that the double contingency principle is met. A source of flooding concurrent with damaged drums is a very low likelihood. However, unless criticality accidents are justified as not credible, a criticality potential due to large quantities of SNM and residues should be considered in the overall transportation assessment supporting the Site SAR safety analysis and whether any additional TSR controls are warranted. The previous salt transportation risk assessment also did not evaluate criticality risks. (See DOE technical direction in Appendix C).

E. The consequences of a criticality accident are incorrectly reported in the Site SAR and CALC-RFP-98.0570-KKK. They are reported as 5.7 rem to the collocated worker and 1.0E-5 rem to the public. These values are based only on the prompt dose contribution. A 1E+18 fission criticality involving 50 ten-gallon drums with 250 kg Pu oxide should result in a failure of the taped 8801/8802 cans resulting in an unfiltered release. This adds 1.2E+5 rem to the collocated worker and 1.2E+3 rem to the MOI per the Site SAR calculations. Both documents should be revised, based on the response to item D. (See DOE technical direction in Appendix C).

F. Since the Site SAR Chapter 8 transportation assessment does not include high-americium salt transfers, the NSTR risk assessment for salt transportation should be added to the Authorization Basis Document List and referenced in the Site SAR Authorization Agreement (until the Site SAR is updated). (See DOE technical direction in Appendix D).

The RFFO review also identified a number of other technical issues related to the risk assessment. These issues are not as significant as the above issues, thus can be resolved through the annual update process. Specific issues and DOE technical directions are listed in Appendix C.

Appendix B
Directed Changes to the Site SAR

1. Include a control for the Shift Superintendent to notify facilities immediately upon identification that a Site Engineered Control has not been met.

2. Provide controls to restrict storage of wooden LLW in areas vulnerable to flooding or identify physical precautions. Add an SEC to "control the ignition sources within 20 feet of the propane tanks."

3. Revise the contractor's USQD procedure 3-J69-NSPM-5C-01 to incorporate Review Report Table 2-9 to evaluate the cumulative impact of a discovery issue or proposed change on composite Site risks until such time that this is incorporated into the SSAR. Develop additional procedural guidance as necessary, and propose changes to Table 2-9 if in individual facility AB (excluding JCO risks that are accepted for a temporary period until the issue is resolved) results in higher risks (i.e., consequence or frequency bin).

4. Implement the following transportation control as soon as possible, identify it in the Site SAR Implementation Plan, or negotiate disposition with RFFO:

   For pickup and delivery of drums with greater than 200 g equivalent WG Pu, add a step for the TSO to ensure that the following controls have been implemented by the building: "Transient combustible materials are not allowed within five feet of the transportation vehicle while loading/unloading drums onto/off the truck. No spark/flame/heat producing work or smoking is allowed on the dock or in the vicinity of the truck when loading/unloading drums onto/off the truck. No flammable liquids, except in approved containers, are allowed on the dock or in the vicinity of the transportation truck while loading/unloading. Shipping containers with more than 200 grams plutonium equivalent will be attended at all times while they are located within an unfiltered area. Revise AB's as required to be consistent with this 200 gram control." (Note: This recommendation was implemented in TSO procedures for only salt residue transfers, and building AB documents are still being revised to address the 200 gram control.)

Appendix C
Comments to be Included in the Annual Update of the Site SAR

1. Delete the analysis for chlorine and sulfur dioxide gases since they have been removed from the Site and the HEUN solutions (shown to be in Building 886) from the criticality composite risk analysis to reflect current Site conditions.

2. Provide a more detailed description of the areas for which storage of LLW wooden crates will be restricted due to the potential for flooding.

3. Perform an SSAR evaluation of aircraft crash risks and determine if additional Site controls (e.g., building or segregation area MAR limits) are warranted based on the *Emergency Preparedness Hazards Assessment* application of DOE-STD-3014-96 that has been performed for 18 facilities. Some individual Category 2 nuclear facilities are addressing this in their annual AB update.

4. Update the building inventories and the corresponding composite risk analysis results.

5. Resolve the issue of Class Y versus Class W solubility between the K-H Team and RFFO Authorization Basis Division, standardize this agreement in SARAH, and revise appropriate ABs during their next annual update or scheduled submittal for new ABs.

6. Resolve the inconsistency regarding the crediting of lightning protection as a design feature when it is also stated that the lightning protection systems have fallen into a state of disrepair and cannot be relied on to provide the needed protection.

7. Replace the MAL discussion in Section 1.6 of the Site SAR with the following:

   "The MAL has been used as a tool to help ensure authorization existed for performing activities. Currently, the Integrated Safety Management System (ISMS) ensures that activities performed at the Site have adequate authorization. For DOE-STD-1027-92 Hazard Category 2 and 3 nuclear facility activities, the Authorization Basis Document List and the ISMS, through the use of the Activity Screening Process and the Nuclear Safety Unreviewed Safety Question Determination process, ensure that the authorization basis is identified and reviewed for adequacy prior to performing work. For non-nuclear activities, the Site SAR identifies the SMPs that affect the ISMS which, in turn, ensures that appropriate authorization (i.e., operational basis for non-nuclear activities) exists."

8. Incorporate the Site-wide JCOs if they still exist and are long term into the Site SAR.

9. The following comments apply to on-site transportation:

   a) Incorporate a summary of the on-site transportation risks from Chapter 8 into Chapter 9, revising appropriate composite risk tables and text discussions.

   b) Revise the risk assessment to reflect a 2% vs. 0.1% probability adjustment for Scenarios 5 and 6 for all material forms. This is consistent with the previously approved transportation analysis for salt residues. It appears that only one Scenario 6 for average residues will change from *Incredible* to *Extremely Unlikely*.

   c) Once the Site SAR is implemented, determine if the accident involving a transport truck outside the dock should be removed from individual facility AB documents.

d) Resolve the issue of appropriate ARFs, RFs, and DRs for drum explosions involving different MARs (e.g., contaminated host materials like most TRU waste and many forms of residues, Pu powders in a residue matrix such as salts or ash, etc.) to be consistent among building ABs and on-site transportation, and the guidance included in an update to SARAH.

e) Revise CALC-RFP-98.0570-KKK to eliminate the oxide drum explosion scenario (i.e., delete the probability and consequences of oxide drum explosions), and delete the 4E-5/yr frequency assignment from page 8-29.

f) Verify the correct maximum capacity of 10-gallon and 55-gallon drums for SNM, residue, and TRU waste on-site transportation, standardize this in SARAH, and revise appropriate ABs during their next annual update or scheduled submittal for new ABs.

g) Verify the bases that there are only 40 residue drums that exceed 1 kg Pu.

h) The statement on page 8-9 of the Site SAR implies that DOT certification of drivers is required and should be clarified that drivers are trained to DOT requirements.

i) Resolve the issue of appropriate ARF for LLW in wood boxes between the K-H Team and RFFO Authorization Basis Division, standardized in SARAH, and appropriate ABs revised during their next annual update or scheduled submittal for new ABs.

j) The frequencies cited on page 8-43 second paragraph are reversed (i.e., average residues are *Extremely Unlikely* and the other three MAR are *Incredible*).

k) RFFO concurs with the conclusion that for Scenarios 7 (hydrogen explosion) and 8 (pyrophoric fire), the frequency of two containers should be very low. However, the mathematical argument of squaring the one drum frequency of occurrence is not statistically correct and should be re-evaluated.

l) The frequency and consequence calculations based on number of drums or crates on a truck do not agree. For example in CALC-RFP-98.0570, 50 TRU drums are assumed to calculate the frequency on page 11, but 30 drums are assumed for the consequence assessment on page 19. Similarly, 10 versus 20 TRU crates, 20 versus 23 oxide drums, and 30 versus 50 liquid drums are assumed. Also when calculating the probability that various MAR forms are present for Scenario 6, the "c)" and "d)" calculational steps assume a different number of transfers/yr. These errors should be corrected and Chapter 8 discussions revised accordingly.

m) The frequencies cited in Table 8-30 should be changed from *Unlikely* to *Extremely Unlikely* to agree with the risk class determinations and CALC-RFP-98.0570-KKK.

n) Assumption #1 of CALC-RFP-98.0570-KKK should be revised to reflect that Scenario 5 is a lofted fire.

o) Page 20 of CALC-RFP-98.0570-KKK shows that Scenario 7 involving TRU waste in crates assumes a 5E-3 ARF with 30% RF, which is inconsistent with all other MAR forms, including waste in drums which is 1E-3*100%.

p) Evaluate credible criticality transportation accidents (frequencies, consequences, risks, and whether additional TSR controls are warranted) unless it is justified to be *Incredible*, and include both the plume dose and the prompt dose contributions.

q) Disposition the frequency (Scenario 5 verses 6) and consequence (higher source terms) issues associated with the risk assessment of hazardous chemical on-site transportation (as documented in Section 8.7 and CALC-RFP-98.0660-MAN)

r) Consider whether the *High/Moderate/Low* levels as used for other BIO-type risk assessments could be established to provide perspectives on the magnitude of potential consequences for the fuels risk assessment (Section 8.8 and CALC-RFP-98.0717-KKK).

Appendix D
Issues to be Addressed Upon Site SAR Implementation

1. Progress by the contractor toward phasing out propane and replacement with natural gas.

2. Progress by the contractor in analyzing the natural gas lines leading up to a facility and in validating that the natural gas lines internal to the facilities were purged prior to blanking at the facility boundary.

3. Adequacy of a listing of procedures which support the Operational Control surveillances to ensure that the functionality is defined. Provide copies of these procedures.

4. Determine the method for tracking and trending noncompliances with SECs and SMCs as well as identification of any necessary, pre-defined remedial actions.

5. Analyze the cumulative effect of the existing exemptions and CSAs against the Site SAR analysis and controls.

6. Resolve the inconsistency regarding the crediting of lightning protection as a design feature when it is also stated that the lightning protection systems have fallen into a state of disrepair and cannot be relied on to provide the needed protection.

7. Provide a list to RFFO of the facilities which have analyzed the natural gas lines leading up to each facility.

8. The RFFO recommends the following priority for Site SAR implementation:
   - Transportation
   - Operational Controls in Volume I
   - SMPs
   - Controls from the FSAs in Volume II

9. Whenever practical, reduce the shipment inventories of residues to less than SNM Category II shipments to reduce the potential radiological consequences to the public and collocated worker (which will also result in cost reductions by eliminating safeguards and security controls).

10. Revise the Site SAR on-site transportation risk assessment of radioactive materials to incorporate the previous risk assessment and controls for salt stabilization. Until this revision is made, include the salt transportation NSTR on the ABDL and Site SAR Authorization Agreement.

11. Identify drum venting in the transportation accident analysis and operational controls sections as a specifically-credited control to reduce the frequency of hydrogen gas explosions to *Extremely Unlikely*, rather than treating it as defense in depth.

12. For future USQDs of proposed changes or discovery issues, the combined frequency for SNM and salt residues on-site transfers should be used to determine if there is a potential change in frequency.

13. Identify the flow down of requirements from the DOE Orders to the Manuals.

14. Move the Section 8.10 On-site transportation Operational Controls to Chapter 7 and disposition the additional RFFO-listed controls identified in Table 6 of Appendix A.

15. Address redundancy of the electrical system if the Site were to lose one of its power feeds.

16. Include remedial actions and specific expected capacities in SEC 6, Nitrogen Supply, similar to those in SEC 1, Fire Protection Water System.

APPENDIX E
SITE SAR REVIEW TEAM MEMBERS AND EXPERIENCE

Mary E. Regan — Team Lead

Organization: Authorization Basis Division

Areas of Expertise: Authorization basis, safety analysis

Depth of Review: Detailed review of the entire Site SAR contents, detailed review of Hazards Analysis and Operational Controls

Relevant Experience: Over twelve years in nuclear and general engineer positions including three years at the supervisory level, holding these positions at DOE field and Headquarters sites. A majority of this experience has been in safety and engineering related organizations with an emphasis on contractor assessments and on standards identification and management. Significant training and experience in project management and controls. Major assignments have included coordination of the Department's response to the DNFSB Recommendation 90-2, representation of the RFFO on the Department's Standards Committee, preparation and presentation of testimony for public hearings, development of the certification program for Office of Security Evaluations, and removal from Rocky Flats and disassembly of pits not suitable for long term storage.

James M. Conti - Core Team Member, Initial Team Lead from 1996 to 5/97

Organization: Authorization Basis Division

Area of Expertise: Authorization basis, safety analysis

Depth of Review: Detailed review of the entire Site SAR contents, detailed review of Hazards Analysis and Operational Controls.

Relevant Experience: Twelve years of experience in shipyards, working in the nuclear test engineering organization for submarine reactor plant operations and testing. Qualified shift test engineer on S5W and S6G reactor plants. Appointed Chief Test Engineer for several overhauls/availabilities. One and one-half years experience as DOE Facility Representative at Fast Flux Test Facility at Hanford, Washington. Six years experience in the Rocky Flats Field Office (RFFO) Nuclear Safety Organization. One year acting nuclear safety lead. Participated in Building 707 resumption review, reviewed Unreviewed Safety Questions for RFFO approval, reviewed Justifications for Continued Operation and Technical Safety Requirement proposed changes for RFFO approval, reviewed contractor procedures for implementation of RFFO Nuclear Safety requirements, lead RFFO representative for Price Anderson Act rules implementation. Review Team Lead for B886 BIO, B771 BFO and 779 Closure BIO.

Shirley J. Olinger — Core Team Member

Organization: Authorization Basis Division

Area of Expertise: Authorization basis, safety analysis

Depth of Review: Review of the entire Site SAR contents, detailed review of Hazards Analysis and Operational Controls.

Relevant Experience: Over 18 years of government and A&E experience with 15 of those in the nuclear field. She holds a BS in Civil Engineering and has received extensive nuclear course work from the Pearl Harbor Naval Shipyard in the nuclear navy program and extensive safety analysis course work from DOE. Currently, she is the Director of the Authorization Basis Division. She has held numerous middle and upper management positions in the technical support and oversight fields. She set licensing conditions for the nuclear and non-nuclear facilities, ensured operational readiness, orchestrated the action plans to address DNFSB recommendations, evaluated programmatic alternatives, assisted in numerous risk management decisions by providing the analysis perspective, prepared planning and integration documents, and established the ES&H programs for RFFO. Prior to joining the RFFO, she was a Section Manager for the Savannah River Restart Division at DOE/HQ. She provided direction and program oversight in the technical aspects relating to Savannah River reactor restart including safety analyses, seismic, intergranular stress corrosion cracking, and thermal hydraulics. She was a manager at Pearl Harbor Naval Shipyards from 1982 to 1987. She was responsible for technical support of overhauls, defuelings, and testing of several naval nuclear propulsion plants. From 1979 to 1982, she performed structural and civil engineering work for a private A&E firm in Hawaii and for the U.S. Forest Service in Oregon.

Terry Foppe — Core Team Member

Organization: Foppe & Associates, Inc. supporting RFFO Authorization Basis Division

Area of Expertise: Authorization basis, safety analysis, risk assessments

Depth of Review: Detailed review of hazard and accident analyses or risk assessment sections for on-site transportation risks and site-wide composite risks, and their supporting nuclear safety calculations.

Relevant Experience: Approximately twenty-four years of professional experience in safety analysis, risk assessments, fire protection engineering, and occupational safety and health. Provided safety analysis, hazards and accident analysis, and qualitative or quantitative risk assessments of non-reactor nuclear and hazardous chemical facilities at the Rocky Flats Site for the past 15 years to the operating contractor or the DOE RFFO. These evaluations were developed for authorization basis documents such as SARs for seven plutonium buildings, hazard classifications of facilities and activities, safety classifications of structures, systems, and components, OSRs for nine plutonium buildings (and some of their updating to TSRs), and USQDs; NEPA Environmental Assessments and Environmental Impact Statements; off-site emergency planning; radiological and chemical sabotage; and risk management decision making for structural upgrades or risk acceptance. Previously, developed, coordinated, and implemented safety management and fire protection programs for DOE and other commercial companies to protect employees, property, the public, and the environment. Registered Professional Engineer (fire protection engineering). Certified Safety Professional (comprehensive practice).

David G. Griffith - Core Team Member

Organization: Authorization Basis Group

Area of Experience: Nuclear Safety, Authorization Basis, Safety Analysis, and Engineered Safety Systems.

Depth of Review: Review of entire SITE SAR Volume I and II. Special emphasis in the areas of Hazard/Accident Analysis, both Facility and Site Operational Controls (Administrative, Engineered and Management), Safety Evaluations and Composite Risk.

Relevant Experience: Over fifteen years nuclear experience, including eight years at RFFO, four years naval reactor plant fluid systems design (S5W) and naval reactors prototype refueling & servicing (D1G, S3G and S7G). Also, four years commercial nuclear reactor plant design and analysis of engineered safety systems. Relevant experience at RFFO includes Review Team Lead for the 750/904 FSAR and Live Fire Range Risk Analysis Report. Review team member of various new AB documents (FSARs, BIOs, BFOs) and individual reviewer of numerous USQDs, JCOs and OSR/TSR page changes for RFFO approval. Also, participated in RFFO support of B559 & 707 resumptions, B371 ORR for Tank Draining & CWTS, 707RA for Salt Stabilization, B569 BIO IVR, and B771 Activity Oversight of the K-H B771 BFO IVR.

David E. Faulkner — Core Team Member

Organization: Authorization Basis Division, RFFO

Area of Expertise: Operational Controls

Depth of Review: Detailed review of Operational Controls and Safety Management Programs wih particular emphasis on implementation of Conduct of Operations and Integrated Safety Management principles. Broad review of transportation analysis and associated controls and facility descriptions.

Relevant Experience: Twenty years experience in operations, maintenance, and oversight of nuclear facilities in the government and commercial nuclear fields. This included extensive experience in the development of administrative controls and implementation of operational controls to support analyzed operating conditions, including the performance of nuclear safety reviews. Authored the nuclear safe review program at government facilities including preparing and conducting training on program elements and mentoring the program implementation amongst senior staff.

Pete Lee — Subject Matter Expert

Organization: Engineering Support Division

Area of Expertise: Fire Protection Engineer

Depth of Review: Detailed review of the fire scenarios, controls associated with fire suppression, detection and protection.

Relevant Experience: Total of twelve years experience as a fire protection engineer, with five years at Rocky Flats. Responsibilities and duties included the oversight of the Site Contractor Fire Protection Program and all aspects of is implementation. Also, provided technical Subject Matter Expert support to various RFFO line management and support organizations on fire protection issues. Specific technical support provided to the Nuclear Safety & Emergency Preparedness Division in the area of FSARs, TSR/OSRs, and Operational Readiness Reviews.

Paul P. Psomas — Subject Matter Expert

Organization: AMPA

Area of Expertise: Radiation Protection

Depth of Review: Detailed review of radiation protection.

Relevant Experience: 40 years in the field of radiation protection and health physics.

Larry Maghrak — Subject Matter Expert

Organization: Performance Assessment

Area of Expertise: Conduct of Operations and Integrated Work Control

Depth of Review: Detailed review of Chapter 7 with emphasis on accuracy of facility description and risks associated with routine/normal operations.

Relevant Experience: Participated in the B371 Readiness Review Oversight, B771 COOP Assessment at Rocky Flats. Past experience as a Nuclear Shift Test Engineer at Mare Island Naval Shipyard, Vallejo, CA.

Deanna McCranie — Subject Matter Expert

Organization: AMPA

Area of Expertise: Environmental

Areas of review: General review of Building 995, 891/Decon Pad via walkdown and general oversight of facilities.

Relevant Experience:

Rick Dion – Subject Matter Expert

Organization: Waste and Stabilization Operations Assessments Division

Areas of Expertise: South side facilities, specifically Buildings 881, 883, 865, 444, 460, 440, 664, and 906.

Depth of Review: Detailed review of the information pertaining to the above listed facilities.

Relevant Experience: Performed facility representative duties on a day-to-day basis in the above listed facilities.

Eva Jean Bryson - Subject Matter Expert

Organization: Site Environment and Closure Assessment Division, RFFO

Area of Expertise: Industrial/Construction Safety and Health

Depth of Review: Broad review of the entire SAR contents, detailed review of Safety Management Programs and Hazard and Accident Analysis sections.

Relevant Experience: Twelve years experience in the safety and health field, including nine years at RFFO as a safety and health manager. Relevant experience at RFFO includes contractor oversight of construction safety, occupational health, industrial hygiene, occupational safety, electrical safety, ergonomics design evaluation, firearms safety, process safety, inspection and compliance, accident investigation, job safety analysis, abatement programs, program audits, and workers compensation. Participated in reviews for Site Decontamination and Decommissioning, Trench 1 ERE, Building 123 ERE, Building 886 BIO, Building 569 BIO, Building 893 Decon Water Treatment Plant HASP, Buildings 865/881 National Conversion Pilot Project HASP, Site SAR, Building 440 ORR, and North Live Firing Range and Live Fire Shoot House RAR.

Revised 3/99

CORRES. CONTROL
INCOMING LTR NO.

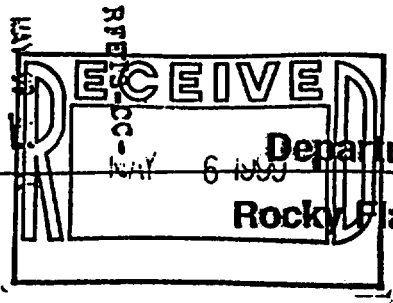
'99 RF 01249

DUE DATE

ACTION

States Government

Memorandum



Department of Energy
Rocky Flats Field Office

MAY 04 1999

DIST.	LTR	ENC
BENSUSSEN, S.J.		
BOGENBERGER, V.		
BORMOLINI, A.M.		
BRAILSFORD, M.D.	X	X
BURDGE, L.		
CARD, R.G.	X	X
COSGROVE, M.M.		
COX, C.M.		
CRAWFORD, A.C.		
DEJONG, V.J.		
DERBY, S.		
DIETERLE, S.E.		
FERRERA, D.W.		
FERRERA, K.P.		
FULTON, J.C.	X	X
GERMAIN, A.L.		
HARDING, W.A.	X	X
HARROUN, W.P.		
HEDAHL, T.G.		
HILL, J.A.		
LEONARD, R.C.		
LEWIS, M.R.		
MARTINEZ, L.A.		
NORTH, K.		
PA[illegible] A.M.	X	X
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RUDY, A.D.		
SANDLIN, N.B.	X	X
SHELTON, D.C.		
TUOR, N.R.		
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ADMIN. RECORD		
PATS/TI130G		

Reviewed for Addressee
Corres. Control RFP

5/6/99 [signature]
Date By

Ref Ltr # RF 01249

DOE ORDER #

AME:ABD:RGB:02961

Approval of Revision 1 to the Site Safety Analysis Report Transportation Analysis and Controls

Marvin D. Brailsford, Vice President
Safeguards, Security, Site Operations & Integration
Kaiser-Hill Company, L.L.C.

Reference: Letter, Brailsford to Lowe, 99-RF-01249, dtd 3/31/99, subject: Transmittal of Site Safety Analysis Report Implementation Plan, Revision 1 – MDB-099-99

The Rocky Flats Field Office (RFFO) has reviewed the proposed revision to the onsite transportation analysis and controls contained in the Site Safety Analysis Report (SAR), which was transmitted by the above reference. The attachment contains the RFFO basis for approval of the proposed revision. The proposed revision is approved with the technical direction contained in the attachment.

The reference also submitted a draft version of Chapter 7 of the Site SAR (Site Operational Controls) for review and comment by the RFFO. Two general comments were identified: 1) multiple categories of controls should be merged into Administrative Controls and Site Engineered Controls; and 2) the inventory control programs must address how the various Site facilities monitor their radioactive and hazardous materials in order to maintain their hazard categorization. These two issues should be addressed prior to formal submittal of the revised Chapter 7.

This stated technical direction is not intended to impact the cost, schedule, or scope of the contract. If you believe there will be such an impact, you should immediately notify the Contracting Officer's Representative and the Contracting Officer and not implement the technical direction received. Should you have any questions, please contact me at extension 5878, or my point of contact on this matter, Ron Bostic, at extension 2109.

David C. Lowe
Acting Deputy Manager

Attachment

cc w/Att:
P. Bubar, EM-64, HQ
M. Sautman, DNFSB
A. Weadock, EH Site Rep.
M. Haas, AME, RFFO
M. Weis, AMFPA, RFFO
H. Dalton, AMFD, RFFO
C. Dan, CAMD, RFFO
S. Olinger, ABD, RFFO
D. Noyes, FAD, RFFO
J. Fulton, K-H
A. Parker, K-H
W. Harding, K-H
F. Ito, K-H
D. Branch, K-H
H. Gilpin, K-H
J. Miller, K-H

Attachment

Basis For Approval
Revised Site SAR Transportation
Analysis and Controls

Scope of Change:

The accident analysis and risk assessment of onsite transportation published in Chapter 8 of the Site Safety Analysis Report (SAR) and approved in the DOE Review Report was extensively revised. The original set of controls proposed by Kaiser-Hill and approved by the RFFO included a large number of defense in depth controls and was a very extensive set of controls. However, it was determined that the implementation cost and schedule for the approved transportation controls was not acceptable. Therefore, an effort was undertaken to define a set of transportation controls that adequately managed the risk, but was more easily implemented. These changes were captured in this revision to the Site SAR Transportation analysis and controls. The primary purposes of this revision are to:

(1) Clarify how specific controls were credited to reduce frequency or consequences which are then addressed in the Site SAR Chapter 7, Site Operational Controls
(2) Provide a bases for those controls no longer credited (e.g., affected maximum material at risk [MAR] assumptions for some types of materials and probability modifiers such as lack of metal beds on all vehicles transporting wastes) and do not provide significant defense in depth warranting TSR AC coverage
(3) Include one new scenario involving forklift movements of TRU wastes in oversized metal containers; and
(4) Address some of the DOE Technical Direction from the Review Report that could be readily resolved during this revision.

Approval Basis:

The revised assessment is documented in CALC-RFP-98.0570-KKK-R01. Results of the revised assessment are summarized in Table 1. This shows that SNM movements (conservatively modeled as Pu oxide) contribute approximately half of the total onsite transportation risks. TRU wastes are the next most significant contributors that are about one-third of the total onsite transportation risk. All other MAR forms of transfers contribute a small percentage to the total risk. Table 1 also shows that a potential pyrophoric Pu fire is the most significant contributor to total onsite transportation risk with about 40% (primarily due to a conservative estimate of frequency), that the propane tanker explosion is next contributing approximately 20%, and the new forklift scenario is also significant contributing about 14%.

Table 1. Revised Risks and Their Contributions

	MOI Risk		Collocated Worker Risk	
Material Type	rem/yr	% of Total	rem/yr	% of Total
Oxide	8.9E-05	50.4%	8.5E-03	54.9%
Average Residue	5.7E-06	3.2%	5.6E-04	3.6%
Hi-Am Residue	7.0E-06	4.0%	6.8E-04	4.4%
Liquids	4.0E-06	2.3%	1.6E-04	1.0%
Hi-Con. Liquids	3.8E-07	0.2%	1.6E-05	0.1%
TRU Wastes	6.0E-05	33.6%	4.7E-03	30.6%
LLW	5.3E-06	3.0%	5.0E-04	3.3%
Sources & Samples	6.0E-06	3.4%	3.3E-04	2.1%
Total Risk (rem/yr)	1.8E-04	100.0%	1.5E-02	100.0%
Scenario	rem/yr	% of Total	rem/yr	% of Total
2 Minor Spill	3.6E-06	2.0%	3.5E-04	2.3%
3 Medium Spill	3.8E-06	2.2%	3.7E-04	2.4%
4 Major Spill	7.5E-06	4.2%	7.3E-04	4.7%
5 Crash & Fire	4.6E-06	2.6%	1.6E-04	1.1%
6 Vehicle Fire	2.4E-05	13.6%	8.5E-04	5.5%
7 H2 Explosion	5.8E-06	3.3%	5.6E-04	3.6%
8 Pyro Pu Fire	6.7E-05	38%	6.6E-03	42.4%
9 Propane Expl.	3.6E-05	20.5%	3.5E-03	22.9%
Forklift	2.4E-05	13.5%	2.3E-03	15.1%
Total Risk (rem/yr)	1.8E-04	100%	1.5E-02	100%

A comparison to the previous risk accepted in the DOE Review Report is provided in Table 2. This shows that overall conclusions have not changed significantly. The total onsite transportation risk is even lower than before (i.e., a 59% reduction in risk), and thus does not invalidate the risk comparisons and conclusions made in the Review Report. SNM movements are still the most significant contributors to risk, contributions from residues are significantly lower (from 22% to 3%), and contributions from TRU wastes are higher (from 12% to about 33%). Other changes were not significant.

Table 2. Comparison of Revised Risks to DOE Review Report

	DOE Review Report		Revised K-H Assessment		% Change
	MOI Risk (rem/yr)	% Contribution	MOI Risk (rem/yr)	% Contribution	
SNM Metals & Oxides	2.8E-04	64%	8.9E-05	50.4%	-68%
Pu Residues	9.6E-05	22%	5.7E-06	3.2%	-94%
Pu Salts	9.3E-06	2%	7.0E-06	4.0%	-25%
Pu Liquids	4.4E-07	< 1%	4.0E-06	2.3%	810%
Pu High-Conc. Liquids	8.5E-08	< 1%	3.8E-07	0.2%	350%
TRU (drums and boxes)	5.1E-05	12%	6.0E-05	33.6%	17%
LLW (drums and crates)	1.4E-08	< 1%	5.3E-06	3.0%	37816%
Sources & Samples			6.0E-06	3.4%	N/A
Total Risk	4.4E-04	100%	1.8E-04	100.0%	-59%

The calculation methodology is generally consistent with that previously applied for previous onsite transportation risk assessments. Specific assumptions were changed that influences the types of transportation (i.e., categories of truck load MARs > 16 kg equivalent WG Pu [e.g., SNM, high americium residues, and other high Pu residues], > 6 kg equivalent WG Pu [e.g., residues], > 200 g equivalent WG Pu [e.g. TRU wastes], and < 200 g equivalent WG Pu [e.g., LLW, samples, sources]), number of movements for each of these categories, certain probability adjustment factors, and application of the 1% respirable fraction for all residues for most scenarios. A recent review of the residue characterization database (that was approximately 70% completed in July 1998) resulted in a median dispersible fraction (i.e., < 10 μm geometric diameter or equivalent 34 μm AED) of 0.1%, and a 95th Upper Confidence Level dispersible fraction of 1.4% for salts, 5.4% for ash, and 2.2% for dry repack noncombustibles (which would translate into RFs of 0.4%, 1.6%, and 0.7%, respectively, using the radiological sabotage vulnerability 0.3 conversion factor for < 10 μm AED). During the last cross-table review of the 1998 draft Building 991 FSAR, a decision was made by the DOE and K-H to lower the respirable fraction (RF) for many residue scenarios based on a bounding estimate, not a median value. For accident scenarios that do not sub-divide the original Pu or host material particle size distribution, a 1% RF can be applied for future generation of or revisions to AB documents. Recent reviews for POC storage in tents has raised a concern that the 1% RF may not be sufficiently bounding because ash residues were about 2% respirable based on the 95th confidence and that maximum measured value was as high as 4.4% RF. The Residue Characterization Program has almost completed their sampling of approximately 1,300 residue containers and should be reviewed to determine if the 1% RF is still an appropriate value. This can be accomplished when the Residue Characterization Program is completed and incorporated into annual updates to ABs and in SARAH because potential increases in the RF by factors of 2 to 5 (i.e., up to a 5% RF) are not expected to significantly change the consequence assignment or risk class for evaluated scenarios. A number of review comments were informally discussed with the contractor. Some of the comments on the revised calculations include:

- Revised frequency modifiers based on percentage of time that different MAR quantities are present
- Frequency calculations for residue drum explosions that have not been accepted by SSOC for some Pu buildings
- Source term release estimates for residue and TRU drum explosions
- Overly-conservative assumptions of high americium MAR of 272,575 g Pu that is equivalent to approximately 1.3 metric tons of Solubility Class Y WG Pu (but results are bounded by the SNM risks dominated by 250 kg WG Pu oxide because of the 1% respirable fraction assumption for residues)
- Incorrect treatment of Solubility Class W versus Y dose conversion factors in equivalent weapons grade plutonium calculations
- Presentation and usage of the 9/98-adopted frequency-based accident Evaluation Guidelines (which were not used to establish the credited transportation controls that are based on the DOE Standard 3011 BIO risk criteria)

- Source term release estimates for forklift puncture scenarios that is evaluated inconsistently among Site ABs
- Inconsistent margins for increasing LLW MAR compared to increasing TRU MAR to establish bounding estimates (e.g., a 25% increase is assumed for TRU drums, but no margin for TRU drums or for LLW crates)
- Evaluation of pyrophoric forms of high americium residues that have been subsequently characterized as not pyrophoric per the Residue Characterization program
- Lack of considering unfiltered criticality doses from the plume instead of only reporting the direct dose in the conclusions (but they are present in the calculations)
- Double counting the frequency of some TRU, LLW, liquids, high concentration liquids, and samples/sources scenarios that has the effect of overstating their risks
- After the Residue Characterization Program has completed sampling containers to meet their statistical criteria for a representative sample, the database should be reviewed to confirm the 1% bounding RF value being applied for residues, or recommend a more suitable bounding estimate. The merit of establishing the bounding estimate based on the maximum measured RF versus a 95th upper confidence level or 95th percentile, especially for scenarios involving a limited number of containers, should also be investigated. Appropriate conversions of the measured mass diameter to aerodynamic equivalent diameters should be included.

It was decided that these could be addressed during the next annual update of the Site SAR, along with resolution of all of the Technical Direction in the DOE Review Report. Many of the comments are affected by a planned change in calculating frequencies of accidents (i.e., the methodology using the RFETS onsite adjustment factor may be changed to be consistent with other DOE onsite transportation risk assessments). Resolution of these comments are not expected to drive the need for additional TSR controls, but could impact risk perspectives as discussed above.

The transportation control set was restructured and significantly reduced in size. The new control set primarily focuses on controls that were specifically credited to either reduce the frequency of occurrence of an accident or mitigate the consequences of an accident. The controls were restructured to be more consistent with the current onsite transportation infrastructure. Most of the defense in depth transportation controls that were required by the original Site SAR are invoked by either the Onsite Transportation Manual or the various Site procedures that control transportation. But increasing the rigor of these controls by making them Technical Safety Requirement (TSR) level controls is not cost effective and adds little to reducing the risk of onsite transportation.

The new restructured controls were reviewed by the RFFO and discussed at several meetings with Kaiser-Hill. All of the RFFO issues have been adequately resolved or are resolved by the technical direction in the Conclusion section below.

Conclusion:

The revised set of Site transportation controls and the supporting calculations (CALC-RFP-98.0570-KKK-R01) adequately analyze and control the hazards and risk associated with onsite transportation at RFETS and are approved with the following technical direction:

DOE Direction:

1. Add the following Note to STC 1, STC 2, and STC 3: "No control is identified for controlling transfers during severe weather. The base frequency for the accident scenarios that are based on accidents per mile incorporates accident frequencies due to adverse weather conditions."
2. Revise the Bases statements for STC 1 Program Element 2, STC 2 Program Element 2, STC 3 Program Element 2 to read: "The initiating frequency qualitatively estimated an electrical malfunction spreading to the cargo. Elimination of excess combustible material helps control the probability of the fire in Scenario 6, but is not credited in the frequency development."
3. Revise the Bases statement for STC 1 Program Element 5 to read: "Control of combustible and flammable materials and ignition sources reduces the potential for material or initiators to be present that may contribute to a fire scenario. Helps control the probability of the fire in Scenario 6, but is not credited in the frequency determination."
4. Revise STC 2 Program Element 3 to read: "Materials transferred in drums under this category shall contain less than 200 grams WG Pu per drum."
5. Add the following Program Element to STC 2 and STC 3: "Transfer vehicle shall not exceed the posted speed limit as indicated on the vehicle speedometer, except as directed during emergency or security situations." The following Bases statement shall be added to STC 2 and STC 3 for this Program Element: "This evaluation assumed low vehicle speeds for the development of the spill scenario severity categories."
6. Revise STC 2 Program Element 8 to read: "Establish radio communication. In the event of a security or emergency response in the vicinity of the transfer vehicle, stop the transfer vehicle."
7. Delete Section 7.7.2, Transfer/Delivery of Non-Radioactive hazardous Materials/Substances/Wastes, and STC 4 in its entirety.
8. Delete STC 5 Program Element 1 and its Bases.
9. Add the following to STC 1 Program Element 3, STC 2 Program Element 4, and STC 3 Program Element 3: "The on-site transfer packaging complies with the venting and vent inspection requirements."

Revised 7/00

CORRES. CONTROL
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DUE DATE
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DIST.	LTR	ENC
BOGNAR, E.	✓	✓
BRAILSFORD, M.D.	✓	✓
BRANCH, D.B.	✓	✓
CARD, R.G.	✓	✓
CIAGLO, T.	✓	✓
COLALANCIA, M.	✓	✓
CROWE, S.	✓	✓
DYE, A.A.	✓	✓
FERRI, M.S.		
FULTON, J.C.		
GILPIN, H.E.	✓	✓
MARTINEZ, L.A.	✓	✓
MCEAHERN, P.	✓	✓
MILLER, G.M.	✓	✓
MILLER, J.C.	✓	✓
MORGAN, T.		
POWERS, K.P.		
RODGERS, A.D.		
SANDLIN, N.B.	✓	✓
SCOTT, G.K.		
SNYDER, D.	✓	✓
SPEARS, M.	✓	✓
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Date By

Ref Ltr. #
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00 RF 01987
00 RF 02711
DOE ORDER # 5480.23

States Government

Department of Ener
Rocky Flats Field Offi

Memorandum

NOV 28 2000

AME:NRD:RGB:00-03674

Approval of Site Safety Analysis Report Annual Update

Marvin D. Brailsford, Vice President
Project Manager for Material Stewardship and Offsite Shipment
Kaiser-Hill Company, L.L.C.

References: 1) Memo, Brailsford to Weis, dtd 5/19/00, 00-RF-01616, Subject: Site Safety Analysis Report Annual Update Resubmittal (Revision 2), MDB-173-00
2) Memo, Martinez to Dan, dtd 7/6/00, 00-RF-01987, Subject: Revised Pages for Site Safety Analysis Report Annual Update Resubmittal (Revision 2), LAM-322-00
3) Memo, Martinez to Dan, dtd 9/25/00, 00-RF-02711, Subject: Revised Pages for Site Safety Analysis Report Annual Update, Revision 2, Submittal - LAM-455-00

The purpose of this memorandum is to notify Kaiser-Hill Company, L.L.C. that the Reference 1 submittal, along with substitute page changes provided by References 2 and 3, are approved. The proposed changes comprise an annual update to the Site Safety Analysis Report as required by Department of Energy Order 5480.23 to maintain the authorization basis documentation current. The basis for this approval is attached.

This stated technical direction is not intended to impact the cost, schedule, or scope of the contract. If you believe there will be such an impact, you should immediately notify the Contracting Officer's Representative and the Contracting Officer and not implement the technical direction received. Should you have any questions, please call Ron Bostic, my point of contact on this matter, at extension 2109, or me at extension 5878.

[signature]
Paul Golan
Deputy Manager

Attachment

cc w/Att:
M. Jones, EM-33, HQ
S. Stadler, EH-2, HQ
D. Owen, DNFSB
H. Dalton, AMFD, RFFO
J. Legare, AMEI, RFFO
D. Noyes, DAMFA, RFFO
F. Lockhart, AMCPM, RFFO
S. Olinger, AME, RFFO
G. Voorheis, K-H

Attachment

ADDENDUM B TO THE DOE/RFFO REVIEW REPORT FOR THE SITE SAFETY ANALYSIS REPORT, REVISION 2

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

PREPARED BY:
DEPARTMENT OF ENERGY ROCKY FLATS FIELD OFFICE
NUCLEAR REGULATORY DIVISION

Prepared by: _____ 11/13/00
Ron Bostic, Director — Date
Nuclear Regulatory Division

Approved by: _____ 11/20/00
Shirley Olinger — Date
Acting Assistant Manager for Engineering

Reviewed for Classification/UCNI:
By: Terry Foppe (u/nc)
Date: 11-13-00

TABLE OF CONTENTS

BASIS FOR APPROVAL OF SITE SAR, REVISION 2

Executive Summary

This Review Report Addendum B is a Safety Evaluation Report that documents the Department of Energy (DOE) Rocky Flats Field Office (RFFO) review of Revision 2 to the Rocky Flats Environmental Technology Site (Site or RFETS) Site Safety Analysis Report (SSAR). The purpose of the SSAR Revision 2 is to provide an annual update to the Site authorization basis (AB) that includes all new and revised Site activities, as well as the incorporation of salient elements of Unreviewed Safety Question Determinations (USQDs). The technical review was performed in accordance with RFFO Desktop Procedure, "Nuclear Safety Oversight and Review Process for Authorization Basis Related Submittals" (AME-ABD-01), and the concepts of DOE-STD-1104-96, *Review and Approval of Nonreactor Nuclear Safety Analysis Reports*. This review focused primarily on the changes to the SSAR from the Revision 1 as well as evaluating the incorporation of all positive Unreviewed Safety Questions (USQs). This review builds upon the Safety Evaluation Reports for the SSAR Revision 0 (November 1998) and Revision 1 (i.e., Addendum A, May 1999).

The significant changes to the SSAR from the initial Revision 0 approval and Revision 1 approval of transportation changes include the following additions, revisions and deletions (numerous other changes are identified in Section 2.1 of this Addendum B):

- Removed reference to emergency power sources based on safety classification review
- Updated facility summaries in Chapters 1 and 4, Appendix C, and the *Executive Summary* to reflect hazard classification changes (e.g., 750 Pad to Hazard Category 2, 904 Pad clarified as Hazard Category 3, Building 666 TSCA and RCRA Storage Units to Hazard Category 3, plus other changes to radiological and industrial facility classifications)
- Updated aircraft and earthquake sections in Chapter 5 to reflect latest DOE guidance and standards
- Deleted two programs from the Chapter 6 *Safety Management Programs* (i.e., Decommissioning and Safeguards and Security)
- Updated system sections for Site Engineered Controls (SECs) based on SMP changes
- Revised all SECs into functional statements/requirements, added Applicability section, removed notes following tables, updated surveillance requirements
- Developed System Functionality Reports (SFRs) for SECs (similar to System Evaluation Reports for plutonium facilities) to define acceptance criteria, compliance requirements and system boundaries
- Revised SEC 2 (Fire Protection Water), STC 1 (> 6 kg WG Pu transportation), STC 2 (200 g – 6 kg WG Pu transportation), and added new STC 5 (forklifts)
- Clarified WWBSC1 control for wooden waste crates in flooding areas and revised calculation to justify increasing to 50 crates per group

- Revised Chapter 8 onsite transportation accident scenarios per previous technical directions that affected radiological releases calculations, criticalities, hazardous materials releases, and flammable or combustible fuels fires or releases
- Revised analysis for non-residue high americium (Am) radioactive material transportation scenarios based on Discovery USQ issue for STC 2
- Deleted Chapter 9 composite risk summaries
- Incorporated technical direction to move the hazard analysis previously documented in Volume II Facility Safety Analyses (FSAs) on Fuel Gas System, Steam and Condensate System, and Domestic Water System, to Volume I as Appendices D, E, and F, respectively. Revised Chapter 3 accordingly.
- Incorporated technical direction to move the hazard analysis previously documented in Volume II FSAs for the RCRA Storage Units, Building 666 (TSCA Waste Storage Facility), and Building 881, to Volume I as Appendices G, H, and I respectively, since these are Hazard Category 3 nuclear facilities. Revised Chapters 1 and 4 accordingly.

The general conclusion of RFFO's review of the SSAR Revision 2 annual update is that it should be approved conditional to the technical direction contained within Appendix A. Furthermore, this revision of the SSAR adequately addresses transportation Discovery USQ issues identified since Revision 1 as discussed in USQD-RFP-00.0285-BDB, Revision 1 (fuels transportation) and USQD-RFP-00.0293-ARS, Revision 1 (high Am TRU waste transportation). Remaining issues that do not preclude the approval of this document, which should be considered enhancements to a technically sound document, are provided as RFFO technical direction in Appendix C to this Addendum, or affect implementation and are addressed in Appendix B.

This Safety Evaluation Report provides the basis for approval of Revision 2 to the SSAR, dated May 2000.

1.0 Introduction and Summary Conclusion

1.1 Background

The purpose of Revision 2 (Reference 1, as updated by Reference 2 and Reference 3 page changes) to the SSAR is to provide an annual update to the Site AB that includes all new and revised Site activities, as well as the incorporation of salient elements of USQDs. Due to the extensive revisions to the SSAR, the contractor, Kaiser-Hill Company (K-H), has submitted a complete revision rather than specific page changes.

Included in this revision, six FSAs that require DOE RFFO approval were moved from Volume II to Volume I of the SSAR. Three were added as new appendices (Appendices D Fuel Gas Systems, Appendix E Steam and Condensate System, and Appendix F Domestic Water System) to capture hazard analysis previously documented in FSAs which have been removed since they are sitewide support systems that affect nuclear facility ABs and the SSAR Chapter 7 Operational Controls. The other three FSAs (Building 666, Building 881, RCRA Storage Units) were removed from Volume II of the SSAR and upgraded into stand-alone Hazard Category 3 nuclear facility Safety Analysis Reports (SARs) (Appendices G, H, and I, respectively) which are separately reviewed in Section 3 of this Addendum B.

The remaining FSAs in Volume II are not RFFO-approved documents, hence they are not within the scope of the Safety Evaluation Report. These are safety basis documents that provide the technical basis for the contractor's conclusion that they are not nuclear facilities (similar to contractor Nuclear Safety Calculations and Nuclear Safety Technical Reports), and for complying with the hazards analysis guidelines from DOE Standard DOE-EM-STD-5502-94, *Hazard Baseline Documentation*. RFFO has previously concurred with these hazard classifications in the original Review Report for the SSAR (Reference 8). Changes to facility hazard classifications that are approved by this Review Report Addendum B are addressed in Section 2.2.2.

1.2 Review Approach

The technical review focused primarily on the changes to the SSAR from the Revision 1 as well as evaluating the incorporation of all USQDs. The review of the SSAR has been performed in accordance with the guidelines contained in the RFFO Desktop Procedure, "Nuclear Safety Oversight and Review Process for Authorization Basis Related Submittals" (AME-ABD-01), and the concepts presented in DOE-STD-1104, *Review and Approval of Nonreactor Nuclear Safety Analysis Reports*; that is, the review focused on the SSAR's adequacy to the STD-1104's five approval bases:

I. Base Information;
II. Hazard and Accident Analysis;
III. Safety Structures, Systems, and Components (SSCs)[1];

[1] Due to the presentation of the information in the SSAR, the evaluation of Approval Basis III is combined with the Approval Basis IV discussions.

IV. Derivation of Technical Safety Requirements (for the SSAR this basis will be the adequacy of the Site Controls); and
V. Programmatic controls (i.e., SSAR SMPs).

A multidisiplined team that consisted of RFFO Subject Matter Experts as well as RFFO Technical Support Services contractors conducted the review. The review team was under the direction of the RFFO Assistant Manager for Engineering and led by the Nuclear Regulatory Division. Numerous meetings and cross-table reviews between K-H and the RFFO review team have led to mutual agreement on the resolution of the issues identified during the RFFO review process.

A proposed Revision 2 to the SSAR was submitted to RFFO for review and approval in December, 1999 (Reference 4). However, this version was disapproved by RFFO due to numerous technical comments (Reference 5). After cross-table review meetings, K-H documented dispositions to the review comments in Reference 6. RFFO concurs with the Reference 6 dispositions and hereby incorporates them by reference into this basis for approval, unless the issue is further discussed in this Addendum B and technical direction is repeated or updated in the Appendices to this Addendum B. K-H resubmitted a revised SSAR Revision 2 in May, 2000 (Reference 1) that incorporated the agreed-upon dispositions. Subsequently, K-H submitted substitute page changes to the SSAR Revision 2 in July 2000 (Reference 2) and in October 2000 (Reference 3) that are included in this basis for approval.

K-H also submitted another set of page changes in August 2000 (Reference 7) regarding the Configuration Management Safety Management Program (SMP). The August 10, 2000 submittal is not approved by this basis for approval because the entire revised Chapter 6 *Safety Management Programs* was subsequently withdrawn by K-H (Reference 3) in October 2000. Hence, the K-H description of their SMPs will revert back to the previous approved version contained in the SSAR Revision 0, June 1998, with exception for the deletion of two programs as discussed later in Section 2.2.4.

Appendix A, *Directed Changes to the Site Safety Analysis Report, Revision 2*, to this Addendum B lists any conditions of approval and presents any directed changes to the SSAR Revision 2 that needs to be immediately addressed resulting from RFFO's final review of the document. Items that are included in this appendix impact the derivation of controls or are inaccurate or missing and must be corrected prior to issuance of the SSAR. Appendix A may also include other technical directions that require disposition in the near term but may not directly impact a revision to the SSAR prior to issuance.

Appendix B, *Issues to be Addressed upon Site Safety Analysis Report, Revision 2 Implementation*, identifies issues that need to be addressed during the implementation of the SSAR Revision 2 and prior to or during the Implementation Validation Review (IVR). Items included in this appendix are items that typically impact implementation of controls. For example, if critical procedures are being developed to implement a Chapter 7 or Appendix G, H, or I Operational Control, or the justification in the Bases doesn't support the control or Surveillance Requirements, then this issue must be resolved prior to implementation.

Appendix C, *Comments to be Included in the Annual Update to the Site Safety Analysis Report*, presents comments to be included in the annual update of the SSAR resulting from RFFO's final review of the document. Items that are included in Appendix C are typically completeness issues and do not have a direct impact on the safety envelope or conclusion that the SSAR provides an adequate authorization basis. Appendix C may also include technical directions that impact other facility ABs due to sitewide issues or changes in safety analysis methodologies.

This Safety Evaluation Report builds upon the initial review and approval of the SSAR Revision 0 (Reference 8), and the Revision 1 to the SSAR for onsite transportation that is documented in Addendum A to the Review Report (Reference 9).

2.0 Approval Basis for Changes Addressed in SSAR Revision 2

2.1 Description of Proposed Changes

Revision 2 of the SSAR is a complete revision and re-issue of the document. The changes were primarily as a result of implementing technical directions from the RFFO Review Reports of the SSAR Revision 0 (Reference 8) and Revision 1 (Reference 9). Some additional changes were initiated by K-H. There were no new activities added to the SSAR in this revision. However, Discovery USQ issues related to the transportation of high Am non-residue transuranic (TRU) waste and the transporting of fuels resulted in the addition of language to the transportation controls to allow their transport. This is further discussed in Section 2.2.3 of this Addendum B.

Remaining changes to the SSAR from the initial approval (Revision 0) and Revision 1 (transportation analysis) include the following additions, revisions and deletions (per Reference 1 submittal, unless noted as being replaced by the Reference 2 and Reference 3 resubmittals):

Volume I

Executive Summary
- Updated to reflect changes from other chapters

Chapter 1
- Updated facility classifications for FSAs
- Deleted discussions relating to Master Activity List

Chapter 2
- Revised discussion of relocated 10 meter tower

Chapter 3
- Updated sections on Industrial Gas and Sanitary Sewer
- Updated sections on Fuel Gas Systems, Steam & Condensate System, and Domestic Water System to reference Appendices D, E, and F, respectively
- Updated system sections for Site Engineered Controls (SECs)

- Revised Alarm System section to reflect changes in Central Alarm Station/Security Alarm Station
- Removed reference to emergency power sources based on safety classification review

Chapter 4
- Updated hazard identification tables
- Updated facility summaries to reflect hazard classification changes

Chapter 5
- Updated aircraft and earthquake sections to reflect latest DOE guidance and standards
- Reformatted lightning protection discussion

Chapter 6
- Proposed revisions in References 1 and 7 were withdrawn by Reference 3; thus, the original June 1998 versions will remain in effect with the exception of the deletion of two programs as discussed in Section 2.2.4

Chapter 7
- Revised Application section of Administrative Controls (ACs) section (AC Template)
- Removed AC for Facility Inventory and reference to FSAs
- Removed ACs for Pressure Relief Devices and Emergency Response
- Revised all SECs into functional statements/requirements
- Developed System Functionality Reports (SFRs) for SECs
- Combined old SEC 2 and SEC 3 into one new SEC 2 for Site Electrical Power
- Split old SEC 4 into new SEC 3 Life Safety/Disaster Warning and SEC 4 Alarm System
- Removed SEC 5 for Site Steam System
- Removed SEC 8 for Pressure Relief Valves
- Removed SEC 9 for Emergency Operations Center
- Revised STC 1 (Site Transportation Control) load limit control
- Added applicability sections for each STC
- Clarified Am controls for STC 2
- Added new STC 5 for Powered Industrial Trucks (Forklifts)
- Clarified WWBSC1 control for wooden waste crates in flooding areas and revised calculation to justify increasing to 50 crates per group (Reference 2 resubmittal)

Chapter 8
- Revised criticality transportation accident scenario (Reference 2 resubmittal)
- Updated fuel delivery section
- Reanalyzed fuel transfer activities
- Revised analysis for non-residue high Am TRU waste transportation scenarios
- Revised accident analysis calculations based on changes above

Chapter 9

- Withdrew this chapter in its entirety (Reference 3 resubmittal)

Appendix C

- Revised to incorporate facility hazard classification changes

Appendix D, E, and F

- Added as new appendices to capture hazard analysis previously documented in Volume II FSAs (Fuel Gas Systems, Steam and Condensate System, and Domestic Water System) which are sitewide support systems that require RFFO approval as part of Volume I

Appendix G, H, and I

- Added as new appendices to capture hazard analysis previously documented in Volume II FSAs for the RCRA Storage Units, Building 666 (TSCA Waste Storage Facility), and Building 881 – these require RFFO approval of their AB as part of Volume I (Reference 2 resubmittal)

Volume II

- Removed the RCRA Storage, Building 666, and Building 881 FSAs per previous RFFO technical direction, since they are a Hazard Category 3 nuclear facility that require DOE approval of their AB
- Removed three FSAs (Fuel Gas Systems, Steam and Condensate System, and Domestic Water System) per previous RFFO technical direction

There were also numerous minor revisions to update descriptions or references throughout the SSAR. These do not impact the safety analysis and bases for the Chapter 7 control set.

2.2 Evaluation of Proposed Changes

2.2.1 Approval Basis I: Base Information

This information is contained in Chapter 2, *Site Description and Characteristics*, and Chapter 3, *Site Configuration, Support Systems and Utilities* of the SSAR. Significant changes to these chapters are identified in Section 2.1.

Several changes were made to the descriptions contained in Chapter 3 in order to consolidate information that was previously scattered about numerous other places in the SSAR and to reflect current Site configurations. Specifically:

1. Since it is being decommissioned, reference to the Plainview 115kV feeder was eliminated. Decommissioning of this feeder does not affect the reliability of the current system since it only added additional redundancy because the Site is still serviced by two offsite sources.

2. The specific aspects of functionality were extracted and placed in SFRs that serve the same purpose as nuclear facility System Evaluation Reports. The SFRs specify the functionality required to support the controls in Chapter 7 of the SSAR. (The RFFO review of SFRs is further discussed under Section 2.2.3 of this Addendum B.) This change was made as a result of lessons learned since the SSAR was implemented in June 1999. RFFO believes that this will help to eliminate the confusion arising when potential noncompliances or violations are discovered.

Conclusion: The changes are acceptable to RFFO and do not affect the Site's safety basis.

2.2.2 Approval Basis II: Hazard and Accident Analysis

This information is contained in Chapter 4, *Site Hazard Analysis*, Chapter 5, *Natural Phenomena and External Events*, Chapter 8, *Transportation Safety Analysis*, and Chapter 9, *Composite Risk* of the SSAR. Significant changes to these chapters are identified in Section 2.1. (Note: the technical basis for the prior approval of Chapter 8 is contained in References 9 and 12.)

Hazard Categorization

Three facilities were upgraded in their hazard categorization, specifically, the 750 Pad from Hazard Category 3 to Hazard Category 2 (due to the 750/904 Pad Final Safety Analysis Report [FSAR] revision to authorize Pipe Overpack Container storage), and two facilities from Radiological to Hazard Category 3 nuclear facilities, i.e., Building 666 (TSCA Waste Storage Facility) and the RCRA Storage Units. As a result of these upgrades and in accordance with RFFO technical direction (Reference 5), the safety basis for Buildings 666 and RCRA Units, as well as Building 881 (per Reference 8 technical direction) have been upgraded into stand-alone Hazard Category 3 nuclear facility SARs which are presented as SSAR Appendices G, H, and I, respectively. They were moved to the SSAR Volume I because the AB for these three Hazard Category 3 nuclear facilities require DOE approval.

Chapter 4 of Revision 2 also downgraded a number of facilities. The technical basis for downgrading for each facility is documented in revisions to the SSAR Volume II FSAs, Volume I FSAs, or the SSAR Appendix C. RFFO concurs with these changes. These downgradings include:

- Building 124 – from Non-Nuclear Moderate Hazard to Industrial Facility because chlorine gas was eliminated (SSAR Volume I Appendix C and Appendix F Domestic Water System FSA)
- Buildings 462 – from Non-Nuclear Low Hazard to Industrial Facility because hazardous materials were removed (SSAR Volume I Appendix C and Industrial Facilities FSA, Revision 1)
- Buildings 551 – from Non-Nuclear Low Hazard to Industrial Facility because hazardous material quantities reduced to less than thresholds (SSAR Volume I Appendix C and Industrial Facilities FSA, Revision 1)

- Building 552 – from Non-Nuclear Moderate Hazard to Industrial Facility because hazardous material quantities reduced to less than thresholds (SSAR Volume I Appendix C and Industrial Facilities FSA, Revision 1)
- Buildings 865 – from Non-Nuclear Low Hazard to Industrial Facility because hazardous material quantities reduced to less than thresholds and only depleted uranium and beryllium contamination is present (SSAR Volume I Appendix C and Building 865 FSA, Revision 1)
- Building 883 – downgraded from a Radiological Facility to Industrial Facility because depleted uranium inventory was removed and only depleted uranium and beryllium contamination is present (SSAR Volume I Appendix C and Building 883 FSA, Revision 1)
- Building 891 which includes Tanks 900A&B – from Non-Nuclear Moderate Hazard to Non-Nuclear Low Hazard because although several hazardous material quantities exceed thresholds, no significant dispersion would occur (SSAR Volume I Appendix C and Building 891 FSA, Revision 1)

Hazard and Accident Analysis

Revision 2 of the SSAR includes changes to the methodologies for evaluating the affects of seismic events and aircraft crashes. Section 5.2, *Earthquake*, discusses the revised approach for determining the Evaluation Basis Earthquake for the Site that was based on resolution of DNFSB Recommendation 94-3. RFFO concurs that a PC-3 event (i.e., return period of 2,000 years or frequency of occurrence of 5E-4/yr) is the appropriate Performance Category (PC) for the most hazardous RFETS nuclear facilities (e.g., plutonium handling facilities). RFFO concurs that the PC-3 event identified represents a moderate earthquake with a frequency of *Unlikely* (i.e., 5E-4/yr). The most significant change deleted the obsolete Site Design Basis Earthquake of 0.14 g acceleration at bedrock with a frequency of occurrence of 1.2E-3/yr. The revised text clarifies that the Seismic Hazard Curve presented in Figure 5-4 of the SSAR needs to be interpreted by a structural engineer knowledgeable in soil-structure interaction and soil amplification analysis to assist with the actual determination of the ground motion at the surface to be applied to an individual RFETS structure when a PC-3 or PC-2 earthquake is evaluated.

Section 5.6 provides a lightning hazards assessment that was reformatted without any significant changes in the meaning of the SSAR Revision 0 discussion. However, crediting a Lightning Protection System (LPS) has recently been an issue related to the Building 440 Basis for Operations (BFO) and the Building 906 FSAR. These ABs have a Technical Safety Requirement (TSR) Design Feature requirement for a functioning LPS. Since the LPS was not routinely maintained for Building 440 when the BFO was developed, the BFO evaluated the failure of this system and concluded that a lightning-caused fire involving transuranic (TRU) wastes would be bounded by the large facility fire due to LLW wooden waste crate storage[2]. For Building 906, the FSAR credits the safety function such that a lightning-caused facility fire is then judged to be *Beyond Extremely Unlikely*. RFFO concurred with this approach to credit an operable LPS.

[2] Wooden waste crate storage has subsequently been prohibited in Building 440.

However, the recent Building 906 Operational Readiness Review has identified a possible concern for a metal building with a code-compliant LPS of a "side-flash" that could ignite TRU waste containers if they are not adequately separated from the facility metal exterior walls, roof, or structural frame. This could be a positive USQ for TRU waste storage facilities with an exposed structural steel frame such as Buildings 374 (waste storage addition), 440, 569, 664, 776/777, 906, and perhaps others. This concern is currently being evaluated via the Discovery USQ process in Discovery Condition Screen DCS-RFP-01.0111-KGH, "Lightning 'Side-flash' Initiated Fires in the RFETS Nuclear Facilities" (Reference 20). Resolution of this concern could impact the SSAR hazard assessment discussion and methodology that can be addressed in the next annual update.

The SSAR section currently estimates the frequency of a lightning strike and fire for a facility without a functioning LPS to be *Unlikely* based on a number of references (such as a draft DOE Standard whose project has since been canceled) and Site-specific occurrences and other data. Some ABs have recently been approved based on the assumption that it is *Anticipated* if a LPS cannot be credited. Other recent information regarding lightning strike frequencies may not support the original SSAR conclusions. The SSAR also states that LPSs at the Site have generally not been routinely inspected and cannot be credited in the facility AB unless it has been recently inspected and verified to be functional. The SSAR Revision 0 initially had conflicting information on this subject and technical direction was issued to resolve the inconsistencies, which was changed in the SSAR Revision 2 to eliminate the discussion that it was being credited. Technical direction is included in Appendix C to address updating the SSAR lightning hazards assessment to support building AB updates when the facility is not being protected by a functioning LPS, and to address the methodology for buildings with a functioning system (e.g., similar to the Building 906 approach but including the resolution of the side-flash concern). This is viewed as a completeness issue since the approved ABs are either based on the conclusion that an operable LPS makes the frequency *Beyond Extremely Unlikely*, or that facilities that do not have an operable LPS have evaluated this condition and concluded that the risk is bounded by other events (although there also is previous RFFO technical direction that this conclusion needs to be based on comparison with other natural phenomena or external events and not operational-caused fires to support the USQ process). Since most facility ABs are undergoing significant changes due to implementing the June, 2000 Authorization Basis Development Nuclear Licensing Streamline Initiative, the updated methodology should be completed within 30 days after resolution of the Discovery USQ on the potential side-flash concern, and documented in a revision to the *Safety Analysis and Risk Assessment Handbook* (SARAH). A revision to the SSAR Section 5.6 should be reflected in the next annual update to the SSAR, or earlier if other revisions are needed before the next annual update.

Section 5.7, Airplane Crash discusses the revised approach for analyzing aircraft crashes at RFETS. Because the Jefferson County airport is in close proximity to the Site, it is important to assess the potential impacts from aircraft crashes as accurately as possible. DOE-STD-3014-96, *Accident Analysis for Aircraft Crashes into Hazardous Facilities*, specifies an accepted approach for analyzing these types of events. K-H implements the guidelines of DOE-STD-3014 through SARAH, Section 10.4.1, *Airplane Crashes*. In general, RFFO concurs with the K-H approach described within the SSAR, Revision 2; however, RFFO requires, as a condition of SSAR Revision 2 approval, that the DOE-STD-3014's 25 rem CEDE screening criteria value for offsite

radiological consequences be lowered to 5 rem. This will provide consistency with the recently approved Authorization Basis Development Nuclear Licensing Streamlining Initiative (Reference 13). This is included in Appendix A as technical direction approving the attached red-lined page change.

Chapter 8, *Transportation Safety Analysis*, discusses the hazards associated with transportation of hazardous and radiological materials on the Site. Through the USQD process, two significant hazards were identified: (1) high Am non-residue waste which was discussed in USQD-RFP-00.0293-ARS (Reference11); and (2) USQD-RFP-00.0285-BDB (Reference 10) which discussed transportation of fuels. These USQs affected revision of Chapter 8 (and Chapter 7 as discussed in Section 2.2.3), and are discussed below along with other changes:

- Regarding the high Am USQD-RFP-00.0293-ARS, RFFO acknowledged the positive USQ and accepted the slight increase in risk in March 2000 (Reference 12), which provided the basis for approval and discussion on the impact on the SSAR Chapter 8 transportation accident analysis. The revised transportation accident analysis calculations are documented in CALC-RFP-98.0570-KKK-R05, "Site SAR Transportation Safety Analysis" (Revision 5, dtd 6/13/00), although the SSAR Revision 2 submittal references the earlier Revision 4 calculation[3]. Page changes to Chapter 7 STC 2 controls were also approved by RFFO and implemented by the contractor.
- Regarding the fuels transportation USQD-RFP-00.0285-BDB, the RFFO initially rejected the USQD and proposed page changes to the SSAR (Reference 14). The USQD was revised and submitted to RFFO for approval along with the SSAR Revision 2 submittal (Reference 1) in May 2000. The proposed page changes to the SSAR Chapters 7 (STC 4) and 8 are included in Revision 2. These changes resolve previous RFFO review comments (Reference 14) and are acceptable to RFFO. RFFO acknowledges that the change in frequency calculations represent a positive USQ and slight increase in risk related to transportation of hazardous materials, and that the frequency for a radiological release is *Beyond Extremely Unlikely*. The major issue was that the Fire Department is being credited in the calculations but STC 4 did not include the restriction on fuel deliveries if the Fire Department is unavailable (e.g., not adequately staffed) – this was resolved by including the control in STC 4. The other major issue was related to an external pool fire near a dock for a nuclear facility. The USQD initially assumed that the pool fire would burn out quickly and not breach the nuclear facility. This assumption was revised to resolve the concern by crediting the Fire Department response. The RFFO Fire Protection Engineering Technical Support Services contractor reviewed the technical bases (CALC-RFP-98.1545-KKK, "Transport of Fuels on Site," Revision 3, dtd 3/13/00) and concurred with the methodology. However, several suggestions were made that should be considered for future flammable pool modeling which were informally provided to the contractor.
- The method of determining dose for high Am materials. The material-at-risk (MAR) was changed to the maximum for the category or maximum per drum where appropriate and the high Am dose conversion factor used for determining the dose.

[3] Revision 5 change involved the criticality accident conclusion.

- The analysis for forklift accidents was revised to use a damage ratio (DR) of 0.25 for spills involving drums to be consistent with building evaluations. The DR for standard waste boxes and pipe overpack containers was changed to 1.0.
- The MAR for an entire truckload was revised to 6,000 grams from 10,000 grams of equivalent weapons grade plutonium based on transfer of 30 55-gallon drums per load instead of 50 10-gallon drums. The MAR for single and three drum accidents were revised to use the maximum allowed per drum based on the criticality limits for high concentration solution transfer.
- The criticality risk assessment (CALC-RFP-98.1545-KKK , Revision 5) was revised to address the potential for a criticality accident to occur in each of the accident scenarios evaluated for plutonium releases in transportation accidents. The revised assessment concluded that a transportation criticality accident would be a *Beyond Extremely Unlikely* (i.e., incredible) event, which addressed the previous RFFO technical direction on this issue. However, the contractor's Criticality Safety organization has not performed a "Criticality Incredibility Analysis" per their process, and therefore does not concur with the initially-submitted SSAR Revision 2 discussion. Thus, the purpose of the Revision 2 page change resubmittal (Reference 2) was to limit the conclusion to only those accidents evaluated in the analysis, which Criticality Safety did concur with. Due to RFFO review comments on this proposed change, this issue will be examined further through the Discovery USQ process because of the potential for unfiltered criticalities associated with handling on the docks would result in similar consequences as from a transportation accident. This is evaluated in the Discovery Condition Screen DCS-RFP-00.2060-ARS, "Criticality Scenarios on Docks and Material Transportation Vehicles" (Reference 15). Also, K-H submitted Exemption Request RFPK-DOE-C-420.1-EX-073 regarding the lack of a criticality accident alarm system for transportation between facilities or staging of fissile materials on some docks. RFFO has rejected the exemption request and provided comments that require disposition (Reference 21).
- Other changes to the hazard and accident analysis were per previous technical directions regarding onsite transportation and their mutually agreed-upon dispositions (Reference 6), or were administrative in nature or reflections of current Site chemical types and quantities. The impact of these changes on risk perspectives were previously discussed in the RFFO approval (Reference 12) of the USQD-RFP-00.0293-ARS (Reference 11). The transportation accident analysis was not upgraded to the June, 2000 Nuclear Licensing Streamline Initiative (Reference 13) that is based on ICRP 68 dose conversion factors and higher threshold for *Low* consequences to the collocated worker and public.

The Chapter 9 *Composite Risk* proposed changes based on Revision 1 to CALC-RFP-98.0796-ARS, "Composite Risk Analysis for the Site SAR" (dtd 12/20/99), were withdrawn during the review cycle by K-H in October 2000 (Reference 3), along with a request to delete the chapter in its entirety. In its place, K-H has committed to RFFO that this chapter will be replaced with a representation of cumulative risk that will be maintained on the K-H Nuclear Safety & Licensing Web page by December 31, 2000. The risk will be shown for selected, representative accidents and adjusted upon annual update of each facility AB to reflect changes in risk profile. RFFO concurs that this change of approach is acceptable, and expects that previous technical directions as identified during the approval of the SSAR Revision 0 and new comments issued in Reference

5 will be dispositioned at that time. Deleting the entire Chapter 9 also has impacts on the *Executive Summary* and Chapter 1 *Introduction*, which should be revised to delete their discussions. This is addressed in Appendix A technical direction approving the attached red-lined page change.

The SSAR does not address the impact of creating the Rock Creek Fish and Wildlife Cooperative Management Area (aka "Rock Creek Reserve") in the northwest corner of the Site. An inter-agency agreement between the U.S. Department of Energy and U.S. Fish and Wildlife Service for the purpose of conserving, protecting, developing, and managing the habitat on approximately 800 acres in the Buffer Zone was signed May 17, 1999 (Reference 16). This had the potential for creating positive USQs for numerous nuclear facilities because it could reduce the minimum Site boundary distances, and significantly increase potential consequences and risks to the public if there would be unrestricted access. However, DOE maintains ownership and access control over the property, which is implemented in a "Coordinated Access Plan, U.S. Fish and Wildlife Service, Rocky Flats Technology Site" (Reference 17). By maintaining access control, Fish and Wildlife Service employees or other authorized visitors to the Rock Creek Reserve can be protected via the Rocky Flats Emergency Plan, and thus did not impact the Site boundary distances used for nuclear facility ABs. This was verified with K-H that the Site E-Plan adequately addresses potential non-Site personnel at the Rock Creek Reserve. Appendix C includes technical direction for this information and the commitment to maintain access control to be included in the next annual update to the SSAR.

Conclusion: The changes to Chapters 4, 5, 8 and 9, as modified by the Appendix A red-lined page changes, are acceptable to RFFO and provide an adequate discussion for this approval basis.

2.2.3 Approval Basis III and IV: Safety SSCs and Site Controls

This information is contained in Chapter 7, *Site Controls*, of the SSAR and in the newly developed SFRs. Major changes to Chapter 7 are identified in Section 2.1. These changes to the controls in Chapter 7 for this revision are significant. A number of controls from the previous SSAR revisions were eliminated, separated or combined with other controls based on reanalysis as well as attempts to make the controls more effective. The SSAR Revision 2 identifies and provides specification for the following controls:

- SEC 1 Fire Protection Water Supply System
- SEC 2 Site Electrical Power
- SEC 3 & 4 Site Alarm System
- SEC 5 Site Steam System (Deleted since the steam system is no longer credited in facility AB documents)
- SEC 6 Nitrogen Supply System
- SEC 7 Propane and Natural Gas Systems
- STC 1 Site Transportation Controls for Quantities > 6 kg WG Pu
- STC 2 Site Transportation Controls for Quantities > 200 grams to 6 kg WG Pu
- STC 3 Site Transportation Controls for Quantities ≤ 200 grams WG Pu
- STC 4 Site Transportation Controls for Fuels

- STC 5 Site Transportation Controls for Powered Industrial Trucks
- WWBSC1 Controls for the Storage/Staging of Wooden Low-Level Waste Boxes
- Sec. 7.5.6 Safety Management Programs

The following controls or other changes to Chapter 7 were deleted, added, or revised:

- Section 7.3 Definitions (deleted SEC Violation; added Functional and SFR; revised Completion Time and Required Action)
- Deleted Facility Inventory Control and Material Management, Section 7.5.2, and deleted the discussion in Section 7.2
- Deleted SEC 3 on substations
- Issued a new SEC 3 on Life Safety/Disaster Warning that was combined with SEC 4 on Site alarm system
- Deleted SEC 7 to maintain pressure relief devices on propane tanks and deleted the Pressure Relief Devices Program discussion in Section 7.2
- Deleted SEC 9 on the Emergency Operations Center and deleted the Emergency Response discussion in Section 7.2
- Revised STC 2 to address Am amounts per USQD-RFP-00.0293-ARS (Reference 11)
- Revised STC 4 to address fuel transportation controls per USQD-RFP-00.0285-BDB (Reference 10)
- Added new STC 5 for Powered Industrial Trucks
- Revised WWBSC 1 from 10 wooden crates to 50 crates per group for outside storage

No justification was provided for most of the changes identified above. However, RFFO had several informal meetings and discussions with K-H and concurred with the intended changes. Most of the deletions were due to the requirement being addressed in SMPs, and not specifically related to the SSAR transportation accident analysis or wooden waste crate outside storage. The following discussions address the more significant revisions and their technical bases from USQDs, revised accident analysis calculations, or other justifications.

The deletion of the inventory and material management control from Chapter 7 is because the FSAs in the SSAR Volume II are based on conservative assumptions of radiological materials that form the basis for USQDs of proposed changes. A significant increase in inventory that would change the "radiological" facility hazard classification to a nuclear facility Hazard Category 3 designation would require a USQD and result in a positive USQ requiring DOE approval.

Based on the evaluation of the hazards discussed in USQD-RFP-00.0285-BDB (Reference 10) and USQD-RFP-00-0293-ARS (Reference 11), new controls have been developed to ensure safety when transporting high Am non-residue waste (STC 2) and fuels (STC 4) around the Site. These controls were previously reviewed and approved by RFFO during disposition of the positive USQs. Also, a new transportation safety control was added (STC 5) to address requirements for powered industrial truck (forklift) movements of radioactive wastes. Their technical bases are provided in Revision 5 to Nuclear Safety calculation CALC-RFP-98.0570-KKK-R05, "Site SAR Transportation Safety Analysis," that was previously reviewed by RFFO.

There have been some recent onsite transportation incidents involving noncompliances with STC controls. For example, transuranic waste drums not in compliance with the *Site Transportation Safety Manual* requirements for approved packages (i.e., missing vents), or containers that exceeded their AB material-at-risk (MAR) limits, were moved between facilities. At the fact-finding meetings, the facilities maintained that receiving the noncompliant containers were not a violation of their facility TSRs, but only an individual deficiency against the SSAR STCs. Neither the shipper nor receiver facility accepted responsibility for shipping or receiving noncompliant containers, but rather pointed to the transportation organization as the responsible party. The transportation organization stated that they relied on the shipper and receiver facilities to ensure containers being transferred were compliant. In the end, very little accountability was determined for the noncompliances. To clarify responsibilities, the K-H transportation department plans to revise their procedures to require the shipper to certify that the containers meet the applicable onsite transportation requirements. Waste receiving facilities either currently have TSRs or are in the process of revising their TSRs based on the *Waste Management Facilities Technical Safety Requirements* that address Required Actions for receiving containers if they are damaged or do not have the required vents, or other specific controls on the dock regarding combustibles and ignitions sources are not met. The facilities are clearly accountable for compliance with approved packaging, MAR limits, and dock combustible/ignition controls if they are addressed in the facility TSRs. It is the RFFO expectation that the shipper and receiver facilities also be made accountable if they cause a STC violation or individual deficiency (see Appendix B technical direction).

The current STCs identify "Specific Controls and Restrictions" and "Credited Programmatic Elements" (CPE). Not meeting the Specific Control/Restriction, or its Required Actions and Completion Times, is defined as a violation of the SSAR Chapter 7 Controls. Not meeting a CPE is an individual deficiency that is tracked and trended to determine a programmatic deficiency. A programmatic deficiency involving a CPE is a violation of the SSAR Chapter 7 Controls. Many of the STC CPEs have specific requirements based on the accident analysis assumptions, and others were based on providing defense in depth. In facility ABs, those specific requirements based on the accident analysis assumptions are addressed in the TSR ACs as Specific Controls/Restrictions. Many of the STC CPEs should also be controlled in the same manner and upgraded to Specific Controls/Restrictions with Required Actions and Completion Times. This is addressed in Appendix C technical direction for the next annual update.

Impacts from removing SEC 5 for Site Steam System were addressed. Removal of this control was justified since two failures (i.e., the primary nitrogen supply must not be functional and the vendor must not be able to provide additional nitrogen within specified time frames) would be required before the steam supply is needed to vaporize liquid nitrogen as a backup source for nitrogen gas generation.[4]

A SFR was issued for the following support systems:

- Chapter 1, Fire Protection Water Supply System

[4] Nitrogen gas is needed to inert the gloveboxes in Buildings 371 and 707.

- Chapter 2, Site Electrical Power
- Chapter 3, Site Alarm System
- Chapter 4, Site Steam System
- Chapter 5, Site Nitrogen Supply System

The SFRs support the SECs in the SSAR Chapter 7 by identifying the functional requirements and acceptance criteria for the support system. It also includes system boundary diagrams and Required Actions if the SEC is not met. The SFRs were patterned after System Evaluation Reports developed for plutonium facilities.

The SFR acceptance criteria are not addressed in the current SSAR Chapter 7. These criteria were established based on System Evaluation Reports. The SFRs were reviewed for adequacy and were acceptable to RFFO. However, the Acceptance Criteria for the Fire Protection Water Supply System requires that the system "Provide adequate fire water pressure." This acceptance criterion is not fully met for all buildings due to a Discovery USQ. USQD-RFP-00.0788-SMS (Reference 18) concluded that a USQ exists for Buildings 559, 771, and 776/777 in regard to fire water pressure limitations, during concurrent fire suppression and plenum deluge system operations[5]. Justification for Continued Operation (Reference 19) requires compensatory measures that are needed to ensure adequate firewater pressures are available at various facilities.

Related to other changes in the SSAR Chapter 7, the following statement was added to the Bases for SEC 2: "In the event that electrical power is lost in a facility, personnel in that facility are to notify the Shift Superintendent of the condition." As stated in SSAR Revision 1, SEC 2 Required Actions, the requirement to notify the Shift Superintendent on loss of power was for the case where Public Service Company notifies the Site (utilities) that an outage is coming. Utilities would then notify the Shift Superintendent, who would notify the facilities within one hour. It was never intended that the Site facilities should have to notify the Shift Superintendent within one hour that they have lost power. The change in SEC 2 language in Revision 2 has apparently confused the original intent of this notification requirement. The SEC 2 Bases statement that was added in Rev. 2 is incorrect. Per request from K-H, it would be more efficient for RFFO to provide technical direction to remove the facility notification statement from the SEC 2 Bases, rather than requesting a formal page change submittal and RFFO approval memorandum. Therefore, this is provided in Appendix A technical direction approving the attached red-lined page change.

The WWBSC 1 low level waste (LLW) wooden crate storage control was revised to clarify flooding related to the Building 991 Canopy storage. Also, based on a change in accident analysis assumptions and methodologies, Kaiser-Hill proposed to increase the previous restriction of 10 crates to 50 crates per group. Some of the assumptions were revised to address previous RFFO review comments and resulted in changes to MAR, DR, airborne release fraction (ARF), respirable fraction (RF), use of high wind dispersion factor, and frequency estimates. The most significant changes are due to reducing the ARF of 5E-2 to 5E-4 for the large fire scenario that involves 50 crates, increasing the 1.0 DR/1E-3 ARF/1.0 RF to 0.1 DR/0.1 ARF/0.7 RF for

[5] Buildings 707, 774 and 991 were also positive USQs initially, but later revisions determined them to be a negative USQD.

the high wind scenario, and decreasing the dispersion factor by approximately a factor of 100. In addition, a methodology change resulted from Reference 13 that allowed use of ICRP 68 dose conversion factors and increases the radiological consequence criteria for *Low* consequences. The revised calculation also evaluates three new scenarios: a spill from a vehicle crash, external gas explosion, and external explosion with fire involving unconfined combustible wastes. The analysis is documented in CALC-RFP-99.0978-KKK-R02, "Wooden Waste Box Storage Accident Analysis" (Revision 2, dtd 6/27/00), although the SSAR Revision 2 submittal references the earlier Revision 1 calculation (Revision 2 addressed ICRP 68 and 100 m collocated worker location). Conclusions are that: (1) seven of the accidents result in *Low* consequences to the collocated worker and public and Risk Class III; and (2) that the explosion plus fire scenario could result in *Moderate* consequences to the collocated worker (8.0 rem) with Risk Class III (due to *Extremely Unlikely* frequency), and would result in *Low* (0.2 rem) consequences to the public with Risk Class IV. All DR/ARF/RF assumptions are consistent with current practices with the exception of the puncture, box drop, and high wind scenarios, which have been changed for the Building 771 BFO Revision 3 and the recently-approved *Safety Analysis for Waste Management Activities* (NSTR-006-99). The SSAR analysis should be updated during the next annual update to apply the current Site practices, since their impacts would not change any of the current *Low* consequence and Risk Class III determinations (see Appendix C technical direction). RFFO does not concur with increasing the limit to 50 crates if stored near Hazard Category 2 facilities. Therefore, a red-lined page change is being approved to keep the existing 10 crate limit if stored near Hazard Category 2 facilities, and to allow the higher 50 crate limit elsewhere (see Appendix A technical direction).

Conclusion: The changes to Chapter 7, as modified by the Appendix A red-lined page changes, are acceptable to RFFO.

2.2.4 Approval Basis V: Programmatic Controls (SMPs)

This information is contained in Chapter 6, *Safety Management Programs*, of the SSAR. The initial SSAR Revision 2 submittal in December 1999 included an attempt to incorporate the RFFO/K-H approved AC Template that was originally written for facility ABs. RFFO provided review comments to K-H (Reference 5) based on reviews by the RFFO SMP Subject Matter Experts. K-H responded with proposed dispositions (Reference 6) and incorporated the agreed-upon changes into the SSAR Revision 2 that was resubmitted in May 2000. In August 2000, K-H recommended deletion of the Configuration Management SMP description (Reference 7).

Recently, K-H and RFFO have agreed to a new strategy (Reference 3) to overhaul the AC Template discussions of SMPs in facility ABs, based in part on providing the full program description in the SSAR. The purpose of the SSAR SMP chapter is to describe the Site's commitment to the overall SMPs. It will include identification of Key Functional Elements and their typical impact on accident analysis assumptions or contribution to defense in depth beyond credited controls. As a minimum, the Key Functional elements for each SMP will include (a) internal program organization and administration with defined scope, roles, and responsibilities; and (b) specific training and qualifications for program personnel commensurate with responsibilities. The SSAR SMP descriptions will also address how compliance with the SMPs will be tracked and trended at the Site ("corporate") level by identifying performance indicators.

This strategy would allow the facility AB to reference the SSAR SMP description and not duplicate the information, and then discuss only building-specific deviations, additions (e.g., unique attributes of a Key Functional Element not discussed in the SSAR), or unique implementation aspects (e.g., facility-specific tracking and trending performance indicators).

Therefore in October 2000, K-H withdrew the entire proposed SSAR Revision 2 Chapter 6 (Reference 3). Because the SMPs are specifically referenced in the building ABs and the SSAR Appendices G, H, and I, as a part of Technical Safety Requirements, and the current SSAR Chapter 6 SMP descriptions are not current, a revised set of SMPs need to be expedited. K-H has committed to submitting them by October 2000 (Reference 3), although this is slipping to mid-November. This revision is expected to be based on incorporating the RFFO/K-H-approved AC Template as modified by the new strategy (Reference 3), recommended changes from previous RFFO review comments as identified in Reference 5 that may still be applicable, previous technical directions issued during approval of building AB implementation of the AC Template (i.e., Buildings 707, 771, 776/777) that may still be applicable, and those changes being proposed by K-H SMP program owners based on the new strategy.

Until the revised SMPs are approved by RFFO, the current SSAR SMP descriptions contained within the previously approved SSAR (Revision 0, June 1998) will remain in effect, except for deletion of some SMPs. K-H requested deletion of Sections 6.6, Decommissioning, Section 6.21 Safeguards and Security, and Section 6.23, Transportation (Reference 3). The K-H basis for deletion is that a description of these three programs is not required by DOE Order 5480.23. RFFO does not concur with this justification because the Order and DOE Standard DOE-STD-3009, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports*, are viewed as a minimum set of requirements and guidelines, and unique information needed to establish an adequate authorization basis should be added as necessary. Since decommissioning activities are addressed in facility ABs as appropriate, a SMP description is not needed in the SSAR. Regarding Safeguards and Security, that program is not relied upon as controls in the SSAR or facility accident analysis assumptions. Therefore, RFFO concurs with deleting these two SMPs as shown in the Reference 3 submittal.

However, RFFO does not concur with deleting the Section 6.23 Transportation SMP. The transportation safety analysis in the SSAR Chapter 8 relies upon a transportation safety program and implementing procedures as described in Section 6.23. As discussed earlier in Section 2.2.3 of this Addendum B, the SSAR Chapter 7 Controls are based in part on CPEs that rely on a defined transportation safety program. Those CPEs that may not warrant upgrading to TSR-level Specific Controls/Restrictions (see Section 2.2.3 discussion) need to be correlated to a revision of the Section 6.23 Transportation SMP, or other Chapter 6 SMPs as appropriate (see Appendix C technical direction). RFFO believes that a separate description of the transportation safety program as a SMP should continue to be provided to support the Site transportation safety analysis in Chapter 8 and the Chapter 7 control set. Therefore, RFFO is not approving the K-H request to delete Section 6.23. Since the 1998 approval of the SSAR, the contractor has upgraded onsite transportation requirements in the *Site Transportation Safety Manual*. Section 6.23 is expected to be updated to reflect current requirements and references as part of the November resubmittal of the Chapter 6 SMPs. It should also be noted that RFFO concurs with K-H that a

Transportation SMP is not required for facility ABs, and those ABs are not expected to include a Transportation SMP when they are revised to implement the new SMP strategy.

Conclusion: The deletions of the Decommissioning and Safeguards and Security SMPs are acceptable to RFFO, but not the Transportation SMP. RFFO will provide a separate basis for approval for the revised Chapter 6 SMP descriptions when they are received in November 2000 as a revision to the RFFO Review Report for the SSAR. This will also include a discussion of the K-H Phase II Standards Assessment whose objective was to assure that requirements of the Site programs flowed down to floor level procedures, and RFFO's validation of SMPs, during the process of declaring readiness to fully implement Integrated Safety Management.

3.0 Hazard Category 3 Nuclear Facilities Review

3.1 Introduction

Appendices G, H, and I of the SSAR comprise the safety analyses for the TSCA Waste Storage Facility, Building 881, and the RCRA Storage Units, respectively. These three facilities are Hazard Category 3 nuclear facilities at RFETS. Other Hazard Category 3 nuclear facilities are addressed in separate AB documents. This section documents the review of these three facilities included in the Site SAR Volume I Appendices.

3.2 Approach

Each of these documents was reviewed in accordance with the directions contained within "Nuclear Safety Oversight and Review Process for Authorization Basis Related Submittals" (AME-ABD-01), which invokes DOE-STD-1104-96, *Review and Approval of Nonreactor Nuclear Safety Analysis Reports*, as the technical basis for evaluating the adequacy of SARs. Following the standard's prescribed methodology, the documents' technical accuracy and completeness were evaluated in the following areas or "approval bases:"

1. Base information
2. Hazard and accident analyses
3. Safety SSCs
4. Derivation of operational controls, and
5. Programmatic control

Based on the review performed on these documents it is recommended that these documents be approved. As such, the technical direction provided in Appendix C should be considered enhancements to technically sound documents that identify a properly derived safety envelope while incorporating many layers of conservatism when analyzing potential accident conditions and residual facility risk. Other, less significant comments were identified by the RFFO reviewers and were informally provided to the contractor to improve the quality of the documents as appropriate during their next annual update.

3.3 Evaluation Results

Because each of these documents follows the same template, many elements of the discussion of a singular document apply to the remaining documents as well. Hence, the findings presented below are to be considered generic to all of the documents.

3.3.1 Base information

- The description of the location of the Site, location of the facility within the Site, its proximity to the public and to other facilities, and identification of the point where Evaluation Guidelines are applied (i.e., location of Maximum Offsite Individual) is clearly identified.

- An adequate description of the historical basis for Site characteristics (e.g., meteorology, hydrology, geology and other natural phenomena) to the extent needed for hazard and accident analyses is provided.

- Sources of external accidents, such as nearby airports or utilities have been clearly identified.

- A clear discussion of facility inputs, outputs, mission, and history is provided.

- A description of the facility process systems, instrumentation, controls, operating parameters, and relationships of SSCs is provided.

3.3.2 Hazard and Accident Analysis

- Based on (1) the identification (i.e., the hazards and quantities identified cover all operations), (2) characterization (i.e., type, quantity, form, and location), and (3) evaluation (the methodology is consistent with the methods referenced in DOE-STD-3009) of the facility hazards in the subject documents, the conclusion that there are no SSCs necessary to protect the collocated workers or the public for the RCRA Storage Units and the Building 661 TSCA storage is valid. One Safety SSC is credited for Building 881 and is addressed in the next Section 3.3.3, Safety SSCs.

- The approaches used in the analyses for the public and collocated workers appear to be reasonable and consistent with accepted DOE practice. Specifically:
    1. Accident selection is consistent with the hazard evaluation,
    2. Selection of natural phenomena and externally initiated events is in accordance with DOE standards,
    3. Accidents selected include all unique and representative accidents,
    4. For each accident analyzed, a basis is explicitly identified for all major parameter values,
    5. General principles are used for accident modeling,

6. Functions of preventive and mitigative features associated with each scenario are clearly explained, and
7. Parameters used for calculation are credible in the context of each overall scenario. The radiological consequence methodology is based on Reference 13 that allows use of ICRP 68 dose conversion factors and increases the collocated worker and public radiological consequence criteria for *Low* consequences.

Since the mission for these three facilities is primarily storage of LLW and mixed wastes, their accident analysis is expected to be upgraded based on the *Safety Analysis for Waste Management Activities* (NSTR-006-99), or the *Safety Analysis and Risk Assessment Handbook*, during their next annual update. This will update some of the obsolete assumptions and methods because the individual FSAs were developed in the 1998 timeframe and Site practices have changed. Examples of obsolete assumptions / methods include a 5E-3 ARF for wooden waste crate fires, seismic collapse DRs (10% from ductwork, 1% from drums, 10% from wooden crates), use of 95th percentile MAR if relatively few drums are involved, *Extremely Unlikely* frequency of fires when crediting the automatic sprinkler system and Fire Department response, material handling drum breach 10% DR, aircraft crash frequency, lack of unmitigated hazards analysis for purpose of designating Safety Significant and Safety Class SSCs, etc.

- However, the hazards analysis required for the facility worker is missing in the AB for the three Hazard Category 3 nuclear facilities. The hazard analysis that has been performed does not appear to meet the intent of DOE Order 5480.23, *Nuclear Safety Analysis Reports*, based on the DOE-STD-3009 guidance. The AB hazard analysis does not consider low-consequence/high-frequency events that may arise during the course of these facilities' activities which mostly impact the facility worker. Although the AB hazards analysis considers the effects of the facility to the collocated workers and to the public (this is provided as a numerical consequence), it does not, in any way, specify safety controls necessary for facility worker safety. To address the safety of facility workers, the Site relies upon the Integrated Work Control Program hazards analysis for compliance with DOE O 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees* and DOE P 450.4, *Integrated Safety Management System*. Collectively, these two Orders require that a systematic full spectrum hazard analysis be performed to identify the safety controls needed to protect the public, workers, and environment from the consequences of DOE activities. As of June, 2000, the Site has adopted a "Nuclear Licensing Streamline Initiative" that in part will require unmitigated hazards analysis and selection of TSR controls to protect the facility workers (i.e., Items 6 and 7 of Reference 13). Appendix C provides technical direction to apply this approach for the next annual update. As permitted by DOE Order 5480.23, DOE-STD-3009, and emphasized in Reference 13, RFFO expects that the "graded approach" will be appropriately applied for the lesser hazards due to the facilities' Hazard Category 3 designation compared to ABs being upgraded for existing Hazard Category 2 nuclear facilities.

- All major pathways for environmental insult are identified as well as the application of defense in depth measures that provide reasonable prevention and mitigation for potential environmental releases.

3.3.3 Safety SSCs

The three Hazard Category 3 nuclear facilities do not include a Safety SSC determination based on DOE Standard DOE-STD-3009. One engineered safety feature is credited in the accident analysis and is included in the TSR Operational Controls, Section 5.3, "Maintenance and Surveillance of Credited Controls." The analysis for Building 881 does take credit for the automatic fire suppression and detection system in both the (1) underlying assumptions to the accident analyses (see Section 4.3.1, Assumptions, paragraph 7) and (2) the scenario development discussion (Section 4.3.3.1, Fire Scenarios). This is a Risk Class IV event due to its *Extremely Unlikely* frequency and *Low* consequences (1.3 rem to collocated worker and 0.015 rem to public).

However, for the large fire scenario discussed in the Building 881 SAR Section 4.3.3.1, the unmitigated case was not evaluated to properly identify Safety SSCs. The current analysis assumes that only 10 drums and 15 crates are involved in the fire due to credited controls, but the unmitigated case is not evaluated to determine whether a larger involvement is physically possible. If the fire suppression system needs to be specifically credited to reduce radiological consequences to within the new Evaluation Guidelines (Items 1 and 2 of Reference 13), then it needs to be designated as Safety Significant per Item 4 or 5 of Reference 13. Since it is not expected that the results from an unmitigated analysis would require a Safety Class SSC designation (i.e., would not exceed 5 rem CEDE to the public per Item 3 of Reference 13), and could possibly result in determining that the system may not need to be credited as Safety Significant per the new Nuclear Licensing Streamline Initiative methodologies (e.g., higher Evaluation Guidelines and lower ICRP 68 dose conversion factors per Reference 13), this assessment can be deferred to the next annual update of the SSAR. Appendix C provides technical direction to perform the unmitigated analysis, Safety Significant SSC determination, and derivation of TSRs.

3.3.4 Derivation of Operational Controls

The controls identified as requiring Operational Control coverage in the hazard and accident analyses have been adequately identified and discussed. However, see earlier discussion in Section 3.3.3 regarding the TSR for the Building 881 automatic fire suppression and detection system. As stated earlier, if the system is required to be credited to reduce radiological consequences, a Limiting Condition for Operation instead of the present Administrative Control is expected, consistent with the new Nuclear Licensing Streamline Initiative guidelines (Reference 13).

3.3.5 Programmatic Controls

The applicable programmatic controls for each facility are identified in the Appendices G, H, and I Section 3.1.1, Facility Participation in Site-Level Implementation of SMPs. However, they are based on the SSAR Revision 2 proposal to revise descriptions of all SMPs, which was withdrawn by K-H (Reference 3). Therefore, this section needs to be updated now to address the currently approved SMP descriptions in the SSAR Chapter 6 (Revision 0, 1998). This is addressed in Appendix A technical direction approving the attached red-lined page change. K-H is planning to resubmit the Chapter 6 SMP descriptions in November 2000 for RFFO review and approval. After their approval, the Appendices G, H, and I SMP discussions are expected to be revised per a K-H recommended implementation plan for the revised SSAR SMP descriptions, or at the next annual update at the latest.

Section 3.1.1 states that a nuclear criticality is not credible at any of these three facilities due to LLW container storage loading and the form and composition of materials stored. The TSCA and RCRA Appendices do not list a Criticality Safety Program as applicable and provide a footnote that criticalities are incredible based on the ANSI Standard 8.3-1986, *Criticality Accident Alarm System*. There are no Nuclear Material Safety Limits for the TSCA and RCRA facilities because LLW storage facilities are exempted per the Site Nuclear Criticality Safety Manual.

Building 881 includes the Criticality Safety Program in a list of applicable SMPs, but then states that it is not applicable for the facility. The Building 881 safety analysis is based on a total MAR of 555 g plutonium that includes 243 g plutonium of LLW (based on a 95th percentile low level waste estimate for 300 drums and 300 crates, not container shipping limits which would result in over a kilogram) and approximately 312 g plutonium holdup in ductwork. The contractor's Criticality Safety organization previously concluded that a criticality is not credible for Building 881 and allowed deactivation of its criticality alarm system. A documented, formal Criticality Incredibility Analysis to support this conclusion could not be found. Since the total MAR exceeds the ANSI Standard 8.3 criterion of 450 g plutonium-239 that determines the need for a criticality alarm system, the facility must rely on a Criticality Safety Program to develop a defensible criticality incredibility argument. The Nuclear Criticality Safety Manual (Revision 2) also requires a Criticality Safety Program for all "facilities that handle, process, store, stage, transfer, transport, etc. a significant quantity of fissionable material," defined as 15 grams (e.g., plutonium, enriched uranium, etc.). It also states that "facilities or operational activities that only contain separately packaged material containing less than 100 nanocuries per gram of transuranic nuclides and less than or equal to 15 grams of fissionable material in a single 55-gallon or larger waste drum/package are exempt. . . Furthermore, individual containers, regardless of volume, with less than 1% of the minimum critical mass (MCM) of fissionable material are also exempt." Therefore, the Criticality Safety Program should be discussed in Section 3.1.2 regarding its bases for the Section 4 Hazards and Accident Analysis. This is addressed in Appendix A technical direction approving the attached red-lined page change. A Criticality Incredibility Analysis should be developed per the current Site process. This is addressed in Appendix B technical direction to be completed prior to SSAR Revision 2 implementation since the MAR assumptions are significantly conservative (i.e., the ductwork holdup is based on a 1 mg/sq. ft. estimate times

a large surface area rather than field measurements, and not every LLW container is at the 95th percentile loading). Alternatively, field measurements of holdup may provide the basis to conclude that the facility total fissile inventory considering holdup and LLW is less than the ANSI Standard 8.3 determination threshold for a criticality alarm system.

The discussion related to each facilities' Integrated Safety Management posture as part of Chapter 3 within Appendices G, H, and I is missing, and is addressed in Appendix C technical direction.

3.4 Hazard Category 3 SAR Conclusions

The conclusion of RFFO's review of the three Hazard Category 3 nuclear facilities SARs is that they should be approved conditional to the technical direction contained within Appendix A (red-lined page changes). The five approval bases from DOE-STD-1104 have been adequately addressed. The ABs for these three facilities are based on an appropriately graded safety analysis. One issue requires resolution during implementation, which is the lack of a documented Criticality Incredibility Analysis for Building 881. There are also some Appendix C technical directions for the next annual update.

4.0 Conclusions

The conclusion of RFFO's review of the SSAR Revision 2 annual update is that it should be approved conditional to the technical direction contained within Appendix A. Furthermore, this revision of the SSAR adequately addresses transportation Discovery USQ issues identified since Revision 1 as discussed in the fuels transportation USQD-RFP-00.0285-BDB (Reference 10) and the high Am TRU waste transportation USQD-RFP-00.0293-ARS (Reference 11). Remaining issues that do not preclude the approval of this document, which should be considered enhancements to a technically sound document, are provided as RFFO technical direction in Appendix C to this Addendum. Issues that require resolution during implementation of the SSAR Revision 2 are addressed in Appendix B.

5.0 References

1. Letter, Brailsford to Weis, 00-RF-01616, dtd 5/19/00, subject: Site Safety Analysis Report (SAR) Annual Update Resubmittal (Revision 2) – MDB-173-00
2. Letter, Martinez to Dan, 00-RF-01987, dtd 7/6/00, subject: Revised Pages for Site Safety Analysis Report (SAR) Annual Update Resubmittal (Revision 2) – LAM-322-00
3. Letter Martinez to Dan, 00-RF-02711, dtd 10/2/00, Revised Pages for Site Safety Analysis Report (SSAR) Annual Update, Revision 2, Submittal – LAM-455-00
4. Letter, Brailsford to Lowe, 99-RF-04935, dtd 12/17/99, subject: Site Safety Analysis Report (SAR) Annual Update Submittal (Revision 2) – MDB-419-99
5. Memorandum, Weis to Brailsford, AME:NRD:MER:00-01790, dtd 3/22/00, subject: Disapproval of the Site Safety Analysis Report Revision 2

6. Letter, Brailsford to Weis, 00-RF-00463, dtd 2/2/00, subject: Site Safety Analysis Report Disposition of Technical Direction Items and Transportation Safety Analysis Review Comments – MDB-033-00
7. Letter, Martinez to Dan, 00-RF-02261, dtd 8/10/00, subject: Safety Management Program Revised Pages for Site Safety Analysis Report Annual Update Resubmittal (Revision 2) – LAM-362-00
8. Memorandum, Klein to Harding, AME:ABD:MER:03196, dtd 11/30/98, subject: Rocky Flats Environmental Technology Site Safety Analysis Report, Revision 0
9. Memorandum, Lowe to Brailsford, AME:ABD:RB:99-02961, dtd 5/4/99, subject: Approval of Revision 1 to the Site Safety Analysis Report Transportation Analysis and Controls
10. Unreviewed Safety Question Determination, USQD-RFP-00.0285-BDB, Revision 1, dtd 5/15/00, "Discovery Issue: Inadequate Safety Analysis for Onsite Truck Accidents Resulting in Fires or Spills"
11. Unreviewed Safety Question Determination, USQD-RFP-00.0293-ARS, Revision 1, dtd 2/25/00, "Site SAR STC 2 Control for Americium"
12. Memorandum, Weis to Gilpin, AME:NRD:MER:00-01938, dtd 3/14/00, subject: High Americium Transuranic Waste Discovery Unreviewed Safety Question
13. Memorandum, Mazurowski to Card, AME:NRD:MP:00-02784, dtd 6/12/00, subject: Authorization Basis Development
14. Memorandum, Weis to Spears, AME:NRD:MER:00-01749, dtd 3/28/00, subject: Onsite Transportation of Fuels Discovery Unreviewed Safety Question
15. Discovery Condition Screen, DCS-RFP-00.2060-ARS, dtd 9/25/00, "Criticality Scenarios on Docks and Material Transportation Vehicles"
16. Interagency Agreement, Number DE-AI34-99 RF 01776 between the U.S. Fish Wildlife Service and the U.S. Department of Energy Rocky Flats Field Office, dtd 5/17/99
17. Coordinated Access Plan, U.S. Fish and Wildlife Service, Rocky Flats Technology Site, dtd 8/4/99
18. Unreviewed Safety Question Determination, USQD-RFP-00.0788-SMS, Revision 3, dtd 6/15/00, "Discovery Issue – Filter Plenum Deluge System Operation During Concurrent Fire Suppression System Operation"
19. Justification for Continued Operation, JCO-RFP-00.0975-TLF, Revision 2, dtd 5/5/00, "Filter Plenum Deluge System Operation During Concurrent Fire Suppression System Operations"
20. Discovery Condition Screen, DCS-RFP-01.0111-KGH, dtd 10/26/00, "Lightning 'Side-flash' Initiated Fires in the RFETS Nuclear Facilities"
21. Memorandum, Golan to Sandlin, AME:NRD:SB:00-03294, dtd 8/30/00, subject: Rejection and Comments on Exemption Request RFPK-DOE-C-420.1-EX-073, Criticality Accident Alarm Coverage During On-Site Transportation and Staging of Approved Packages

APPENDIX A
DIRECTED CHANGES TO THE SITE SAFETY ANALYSIS REPORT, REVISION 2

The following presents changes that must be made to the Site Safety Analysis Report as a condition for the DOE RFFO approval of the document.

1. Based on meetings between RFFO and Kaiser-Hill, several changes to the SSAR Revision 2 were agreed upon. Attachment 1 to this RFFO Review Report Addendum B contains the approved version of these SSAR page changes that shall be incorporated verbatim into Revision 2 prior to distribution.

APPENDIX B
ISSUES TO BE ADDRESSED UPON SITE SAFETY ANALYSIS REPORT, REVISION 2 IMPLEMENTATION

The following presents issues that shall be resolved during implementation of the Revision 2 to the Site Safety Analysis Report, or as stated below.

1. Revise appropriate implementing procedures to assure that the shipper facility certifies that radioactive materials (i.e., wastes and SNM) are packaged per Site requirements prior to transfers, and that either the shipper or receiver facility should be held accountable if they cause a violation or individual deficiency of the STC controls. This accountability is in addition to the shipper or receiver facility receiving a violation or individual deficiency to packaging or dock control requirements as specified in their facility TSRs.
2. Prior to implementation of the SSAR Revision 2, submit to RFFO a Criticality Incredibility Analysis for Building 881 per the current Site process to confirm the previous conclusion that a criticality is not credible for the current mission of the facility, including consideration of holdup. Alternatively, field measurements of holdup may provide the basis to conclude that the facility total fissile inventory considering holdup and LLW is less than the ANSI 8.3 determination threshold for a criticality alarm system.

APPENDIX C

COMMENTS TO BE INCLUDED IN ANNUAL UPDATE OF THE SITE SAFETY ANALYSIS REPORT

The following list presents issues that should be evaluated prior to the next annual update of the SSAR and any required changes to the SSAR incorporated at that time.

1. Update the SSAR lightning hazards assessment in Section 5.6 to support building AB updates when the facility is not being protected by a functioning Lightning Protection System, and to address the methodology for buildings with a functioning system. Most facility ABs are undergoing significant changes due to implementing the 6/12/00 Nuclear Licensing Streamline Initiative. The updated methodology should be completed within 30 days after resolution of the Discovery USQ on the potential side-flash concern, and documented in a revision to the *Safety Analysis and Risk Assessment Handbook*. A revision to the SSAR Section 5.6 should be reflected in the next annual update to the SSAR, or earlier if other revisions are needed before the next annual update.
2. Upgrade the Site Transportation Controls "Credited Programmatic Elements" (CPE) to "Specific Controls or Restrictions" with Required Actions and Completion Times similar to how administrative controls that are being credited in facility-specific accident analyses are currently addressed in their TSR Administrative Controls. If K-H does not believe that a current CPE warrants upgrading to Specific Controls/Restrictions and are adequately addressed in Safety Management Program (SMP) descriptions, then provide this justification to RFFO 90 days prior to the next annual update submittal for concurrence. Those CPEs that may not warrant upgrading to Specific Controls/Restrictions need to be correlated to a revision of the Section 6.23 Transportation SMP, or other Chapter 6 SMPs as appropriate.
3. The SSAR analysis for outside wooden crate storage should be revised during the next annual update to apply the current Site practices related to DR/ARF/RF assumptions for the puncture, box drop, and high wind spills.
4. During the next annual update, include the commitment to maintain access control to the Rock Creek Fish and Wildlife Cooperative Management Area so that U.S. Fish and Wildlife Service employees, or other authorized visitors to the Rock Creek Reserve, can be protected via the Rocky Flats Emergency Plan, and thus not impact the Site boundary distances used for nuclear facility ABs.
5. For the three Hazard Category 3 nuclear facilities, apply the June 2000 "Authorization Basis Development Nuclear Licensing Streamline Initiative" to perform an unmitigated hazards analysis to base Safety Significant SSC determinations and to select TSR controls to protect the immediate worker, collocated worker, and public per Items 4, 5, 6, 7 and 9 of Reference 13. In particular, evaluate the unmitigated large fire scenario for Building 881 to decide whether the fire suppression system should be designated as a Safety Significant SSC. If the fire suppression system is determined to be a Safety Significant SSC per the new guidelines, elevate the present TSR Administrative Control in Section 5.3, Maintenance and Surveillance

of Credited Controls, to a Limiting Condition for Operation with Required Actions and Surveillance Requirements in accordance with Items 10 through 13 of Reference 13.

6. Provide a brief description of each Hazard Category 3 nuclear facility's Integrated Safety Management posture as part of Chapter 3 within Appendices G, H, and I.

7. Building 881, Appendix H: Characterize the material holdup in the Building 881 ducting to ensure that it does not present a corrosive hazard to the duct itself (i.e., the residual Pu material may contain nitrates or halides that may be corrosive to steel ducting).

Attachment 1 to the RFFO Review Report, Addendum B

Site Safety Analysis Report, Revision 2

Regarding Approved "Red-lined" Page Changes

Executive Summary and Introduction (deletion of Chapter 9 references)
Section 5.7.2, Aircraft Accident Screening Criteria (5 rem)
Section 7.5.3 SEC 2 and Bases (deletion of notification requirement)
Section 7.5.5.3 WWBSC 1 and Bases (LLW wooden waste crates)
Appendix G, H, and I Section 3.1.1 (revised SMP discussion)
Appendix H Section 3.1.1 (added Criticality Safety SMP)

tanker truck, either hauling diesel fuel or gasoline, are more probable because this delivery vehicle travels many more miles per year than the larger tankers. Including the probability that the ensuing fire from the 2,000-gallon diesel tanker will not be contained by the Fire Department before it breaches a facility, the final frequency is *incredible*. The consequences of a facility breach are dependent on the location of the breach and the location of radioactive materials in the facility. For illustration, it is assumed the breach due to a diesel fuel fire releases 10,000 grams WG Pu. The consequences of such an accident are 0.96 rem to the MOI and 34 rem to the collocated worker. This relates to a *moderate* consequence with a Risk Class III for the MOI and *high* consequences and Risk Class II for the collocated worker for the estimated frequency. The impact of a fire on a facility or other vehicle is based on the pool size and depth.

Transportation accidents on public highways and railways in the vicinity of RFETS have the potential to affect personnel on the site due to the toxic vapors produced in the event of a spill or fire involving hazardous materials. Because of the distance from these transportation routes to the industrial area of the site, no accident is considered to have the potential to cause a release of fissile and hazardous materials.

Safety Management Programs Summary

The risk and consequences determined through the hazard assessments are based on releases due to accidents or unusual occurrences resulting in a breach of confinement. Chronic exposures to low levels of hazardous materials or the effects of carcinogens were not evaluated because these issues are addressed by other site programs. Routine occupational hazards are regulated by DOE-prescribed occupational safety and health (OSH) standards, as implemented through industrial health and safety programs.

The hazards at RFETS are controlled through engineered features, limiting conditions of operations, surveillances, good management practices, and the site infrastructure as appropriate for the level of hazard in the facility. For instance, nuclear Hazard Category 2 facilities will have more stringent controls than a non-nuclear low hazard facility. Major controls for the prevention and/or mitigation of nuclear accidents include fire protection and criticality safety. Many of the controls in place within the infrastructure of RFETS are necessary regardless of the mission of the site. As hazards are reduced in facilities, the number of controls required will be reduced accordingly.

Chapter 5, *Natural Phenomena and External Events*, provides information, such as occurrence probabilities and hazard curves, used to evaluate natural phenomena and external events in site authorization basis documents.

Chapter 6, *Safety Management Programs*, discusses and references the site programmatic approach to safety management programs for protection of workers, the general public, and the environmental.

Chapter 7, *Site Controls*, contains the controls associated with site-wide systems, activities, or processes.

Chapter 8, *Transportation Safety Analysis*, contains an evaluation of the transport of nuclear materials, radioactive wastes, non-radiological hazardous substances, and fuels within the industrial area of the site. Also included is an assessment of the effects to the site from possible accidents occurring off site.

Appendices - Appendices A and B contain a list of acronyms and a glossary, respectively, of terms used in the Site SAR. Appendix C contains a list of all numbered entities on the site and identifies the current hazard classification and the current authorization basis. Appendices D, E, and F contain the hazard assessment for site systems, fuel, steam, and domestic water, respectively. Appendices G, H, and I contain the safety evaluation for Building 666, Building 881 and related facilities, and the RCRA Units, respectively. These appendices replace the FSAs which evaluated these hazards and facilities in previous versions of the Site SAR.

individual basis, all site facilities fall into one of these categories. Nuclear facilities are further classified according to DOE-STD-1027-92 into hazard Categories 1, 2, and 3. Non-nuclear facilities may be categorized as high, moderate, and low hazard corresponding to the guidance provided in DOE Order 5481.1B (DOE, 1987), which has been superseded for nuclear facilities but still applies to non-nuclear facilities.[a]

RFETS has several nuclear hazard Category 2 and 3, radiological, and non-nuclear moderate and low hazard facilities, but no nuclear hazard Category 1 or non-nuclear high hazard facilities. The nuclear hazard Category 1 classification is reserved for Category A reactors or for facilities specifically designated by the Program Secretarial Officer. Nuclear facilities are required to have a safety analysis report, radiological facilities an auditable safety analysis, and non-nuclear facilities are required to have a safety analysis or an auditable safety analysis depending on the quantities of hazardous materials involved. The Site SAR concept is utilized to provide safety documentation for nuclear Hazard Category 3, non-nuclear, radiological and industrial facilities to reduce the duplication of information, which would be needed if all these facilities had a stand alone safety document. With the changing mission of the site, and as a result, the changing mission of individual facilities, an authorization basis is needed to ensure the safe operation of individual facilities and the site as a whole.

1.1.1 Purpose

The Site SAR serves several purposes. In addition to providing a single source document for reference by other ABs, it provides:

- Safety bases for on-site transportation activities and site systems for performing safety evaluations;
- Safety bases for nuclear Hazard Category 3 facilities (with the exception of Building 886 and the 904 Pad);
- Site-wide controls for transportation activities and for systems credited in facility authorization basis (AB) documents;
- A description of the Safety Management Programs;
- Information on site characteristics, natural phenomena and external events, and site-wide hazards; and
- Facility safety analyses (FSAs) for facilities classified as radiological, non-nuclear, and industrial for performing safety evaluations and providing facility specific controls.

a. The facility classification method described here is not to be confused with the method used for facility dispositioning and decommissioning.

1.1.2 Scope

The scope of the Site SAR is to provide an evaluation of the risks of site activities, systems, and facilities not specifically addressed in facility ABs and to provide site-wide information which can be referenced by other documents. The information contained in the Site SAR includes (a) a description of RFETS and description of site-wide utilities; (b) information on site-wide hazards marginally addressed by other authorization basis, such as probability/frequency information on natural phenomena events, external man-made threats, and threats from near-by facilities; (c) facility interactions; (d) descriptions of the RFETS Safety Management Programs; (e) site-wide operational controls that ensure safe operations of site facilities; (f) on-site transportation accident analysis; and (h) safety bases for nuclear Hazard Category 3 facilities (with the exception of Building 886 and the 904 Pad). This information is to be utilized and referenced by all other facility authorization basis documentation, including stand alone documents produced for nuclear hazard Category 2 facilities. In addition, Volume II of the Site SAR contains a collection of auditable safety analyses in the form of Facility Safety Analyses (FSAs) which cover facilities and activities involving less than nuclear hazard Category 3 quantities of material or which have non-nuclear hazards associated with them.

The following paragraphs describe the classifications of facilities at RFETS and identify the type of safety documentation for those classifications. Appendix C of the Site SAR provides a list of all facilities on the site and identifies the classification of each facility based on the presence of hazardous materials. These facilities (with the exception of industrial facilities) are summarized in the Site SAR, Chapter 4, but are evaluated in the individual authorization basis documents (FSARs, BIOs, or BFOs).

- Nuclear hazard Category 2 facilities contain quantities of nuclear material greater than the hazard Category 2 threshold in DOE-STD-1027-92. Safety documentation for nuclear hazard Category 2 facilities consists of Final Safety Analysis Report (FSAR), Basis for Interim Operations (BIO), or Basis for Operation (BFO) documents. The following facilities at RFETS are classified as nuclear hazard Category 2:

  Building 371, Plutonium Storage and Handling Facility;
  Building 374, Liquid Waste Treatment;
  Building 440, Waste Storage/Shipping and LLW Repackaging Facility;
  Building 559, Plutonium Analytical Laboratory;
  Building 569, Crate Counter Facility;
  Building 664, Waste Storage and Shipping;
  Building 707, Plutonium Manufacturing;
  750 Pad, Storage Pad;
  Building 771, Plutonium Recovery Facility;
  Building 774, Liquid Waste Treatment;
  Building 776/777, Manufacturing Buildings;
  Building 906, Centralized Waste Storage; and
  Building 991, Product Warehouse.

5.7 AIRCRAFT CRASH

5.7.1 Introduction

Aircraft accidents are evaluated in the safety analyses because they have the potential to breach facility confinements and provide an energy source to promote the release and transport of radioactive or other hazardous material. In the event of an aircraft accident involving RFETS, a pilot would be expected to attempt a minimal impact landing; however, data show that approximately 59 percent of accidents happen under conditions in which the pilot has no control, and 31 percent where the pilot has only limited control (Cooper, 1993). Thus, the potential for aircraft accidents involving site facilities requires evaluation.

The Department of Energy has issued a standard, DOE-STD-3014-96 (DOE, 1996), containing specific guidance for the analysis of aircraft accidents at sites with hazardous materials. There are two types of risk from aircraft accidents: first, the risk from nearby airports, and second, the general risk from in-flight operations over the site. Both of these risks must be considered when performing aircraft accident analysis.

A wide variety of aircraft operate in the vicinity of the RFETS. The aircraft range from small single-engine aircraft to large multi-engine airliners. In terms of frequency, the greatest numbers of aircraft are represented by the small plane category associated with the Jefferson County (Jeffco) Airport due to its operational volume and proximity to the site (Jordan, 1997). This includes 143,000 combined annual takeoffs and landings for small planes, and 7,150 combined helicopter takeoffs and landings per year, which are added to the small plane frequency data. Small aircraft are those which weigh less than 12,500 pounds.

5.7.2 Aircraft Accident Screening Criteria

DOE-STD-3014-96 (DOE, 1996) sets up a series of screening criteria to determine the need for aircraft accident analysis at a site. These criteria are as follows:

1. Exposure screening. This screen consists of a simple, conservative analysis of an unmitigated release of all the hazardous material in a facility. The amount of material that would have to be present to create the potential for site boundary exposure guidelines to be exceeded is calculated. This amount is compared to the amount actually present in the facility. The guidelines are:

   a. Radiological exposure - 5 rem (0.05 Sv) committed effective dose equivalent (CEDE).

   b. Hazardous material exposure - Emergency Response Planning Guidelines Level 2 (ERPG-2), as established by the American Industrial Hygiene Association, or:

   c. Where no ERPG-2 guideline is established, the level of concern established by the Environmental Protection Agency.

Site Electrical Power

SEC 2. Ensure the 13.8 kV power is functional.

Applicability: At all times to the following facilities:

- Nuclear hazard Category 2 and 3 facilities - Buildings 371/374, 440, 559, 569, 664, 707, 771/774, 776/777, 881, and 991; and
- Essential support facilities - Building 112 (Telecommunications), Building 115 (EOC and FDC), Building 121 (SAS and SFDC), and Building 765 (CAS).

ACTIONS FOR SEC 2:

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Source of 13.8 kV power is not functional.	A.1 Site Utilities notifies Shift Superintendent following notification by Public Services Company. AND A.2 Shift Superintendent determines affected facilities and notifies these facilities. AND A.3 Site Utilities notifies the Shift Superintendent when the out-of-service condition is corrected.	1 hour 1 hour NA
B. One source of the required two sources of power is degraded.	B.1 Upon notification by the Site Utilities of the condition or pending condition, the Shift Superintendent shall notify facilities of the degraded condition. AND B.2 Upon notification by the Site Utilities that the condition has been corrected, the Shift Superintendent shall notify facilities of the return to normal conditions.	1 hour NA

SURVEILLANCE REQUIREMENTS	FREQUENCY
No surveillance is appropriate for the electrical transmission equipment. The 115 kV equipment is maintained by Public Service of Colorado. Surveillance requirements are defined in Chapter 2 of the Site SFR (RFETS, 1999a).	NA

7.5.5.3 Specific Controls or Restrictions

Table 7-10. Specific Controls for the Storage/Staging of Wooden Low-Level Waste Boxes

(1)	**Wooden boxes and/or half-boxes, any of which contain LLW/LLMW, SHALL NOT be stored within 100 ft of a nuclear hazard Category 2 facility in groups of more than ten (10) boxes. This restriction does not apply during staging, loading, and unloading of LLW/LLMW when attended.**
(2)	**Wooden boxes and/or half-boxes, any of which contain LLW/LLMW, SHALL NOT be stored/staged outside or on docks in groups of more than fifty (50) boxes in areas not addressed in (1) above.**
(3)	**Wooden boxes which contain LLW/LLMW SHALL be stored only on bare pavement, gravel, or dirt areas that do NOT have grass, weeds, or other combustible materials that could propagate a fire to the boxes.**
(4)	**Groupings of up to fifty (50) wooden boxes in outside storage locations, any of which contain LLW/LLMW, SHALL be separated from other combustible materials (e.g., other groups of boxes, lumber, plywood) by 30 feet or more.**
(5)	**Wooden boxes containing LLW/LLMW SHALL NOT be stored outside within fifteen (15) feet of a combustible fuel tank or downslope* of a tank/refueling area.** * Downslope is defined to be within the flow path of a spill, as determined by Fire Protection Engineering.
(6)	**Physical barriers (e.g., concrete Jersey barriers, or other suitable vehicle restriction devices) SHALL be placed to protect those wooden boxes containing LLW/LLMW (groups or individual boxes) from impact when stored/staged outside at distances less than or equal to five (5) feet from improved roadways.**
(7)	**Activities that require a hot work permit SHALL NOT be performed in the area within thirty (30) feet of outside wooden boxes containing LLW/LLMW, unless special precautions are approved in the hot work permit.**
(8)	**Combustible fuel powered motor vehicles (e.g., gasoline, diesel, propane, etc.) SHALL NOT be parked (no operator in attendance) within thirty (30) feet of the allowed outside wooden box groupings which contain LLW/LLMW.** Exception: Vehicles are allowed to be parked within thirty (30) feet for loading, unloading, security, or emergency operations. These vehicles are not to be left unattended, with the exception of security or emergency operations if the situation requires.
(9)	**All groups of wooden boxes stored or staged outside together for more than one working shift with any containing LLW/LLMW SHALL be covered by fiberglass covers or fire retardant tarps.**
(10)	**Surveillance of wooden boxes containing LLW/LLMW to meet these controls SHALL be conducted once per week and documented. This surveillance is the responsibility of the waste crate owner.**

ACTION:

CONDITION	REQUIRED ACTION	COMPLETION TIME
Any above configuration(s) for storage are not met.	Place stored boxes into the proper configuration.	Within a ninety-six (96) hour period from discovery of the non-compliant condition. Note: The 96 hours represents the maximum time allowed to restore the configuration. Deficiencies should always be corrected as soon as practicable.

The fire protection water supply system is considered capable of supplying firewater if there is an adequate water supply in the fire water tank, 215C, the fire pumps will function when needed, and the water can flow through the distribution system supplying water to the facility fire suppression systems and fire hydrants.

Adequate water is considered to be the amount needed for a 2-hour water supply at 1,500 gpm for sprinklers plus 500 gpm for hoses. This calculates to a minimum water volume of 240,000 gallons (Campbell, 1999). Water storage locations and maximum capacities on the site are:

Domestic water supply Building 124:		Fire water supply:	
Tank 215A	299,000 gallons	Tank 215C	473,000 gallons
Tank 215B	473,000 gallons		
Clearwell	275,000 gallons		

Prompt notification ensures activities with a high likelihood of initiating a fire are stopped and appropriate fire surveillances are implemented. Reliance on fire suppression and fire fighting capabilities vary depending upon the activities being performed at the site. An engineering evaluation can assess the current conditions and determine an acceptable period of time for corrective actions.

Bases for Site Engineered Controls for the Site Electrical Power (SEC 2)

Public Service Company of Colorado (PSCo) owns the overhead lines and equipment, including the ring bus up to the 115/13.8 kV substations. At this point site personnel assume the responsibility for the power distribution system. RFETS has ownership for all ground mounted equipment, transformers, overhead equipment, 13.8 kV switchgear, and the 13.8 kV transmission system, with the exception of the 132 transformer.

All major buildings are provided with site power lines for building loads. The power to the site is supplied by 115 kV transmission lines that are separately interconnected with the PSCo transmission grid. Two lines enter the site through the "North Switch Yard," and if necessary, each of the lines can be switched to supply the entire site. All the 115 kV transmission facilities are owned and operated by PSCo, including those located on site. Under normal operating conditions, both 115 kV transmission lines are energized to supply substations that serve the site's 13.8 kV electrical distribution system. Each of the substations consists of two transformers with tie-breaker capability.

The system is typically configured so the transformers in each substation are alternately connected to each north line. The north transmission lines have automatic switching capability located in the "North Switch Yard" which allows either line to supply all transformers in the event the other line is lost.

7.7.5.3 Bases for Control of Storage of Wooden LLW Boxes in Potential Flood Areas

Areas vulnerable flooding in the event of a 25-year storm are identified in *The Rocky Flats Plant Drainage and Flood Control Master Plan* (DOE, 1992). Designation of areas for the outside, unattended storage/staging of wooden waste boxes shall take into consideration which areas on the site are vulnerable to potential flooding.

The Building 335 area is subject to flooding due to the lack of capacity of the adjacent culvert. Building 335 is constructed of sheet-metal material and is used for non-emergency fire equipment storage. Storage of LLW/LLMW in this area is unlikely.

The area containing the trailers to the west of Building 771 is a low-lying flat area north of the drainage from the hill to the south. This area could see ponding due to the security restrictions on the storm pipe draining the area. It is predicted a 25-year flood would not exceed the finished floor elevation of the trailers; however, storage of any material on ground level would be impacted.

The main area for storage of waste boxes vulnerable to flooding at Building 991 is identified as the "canopy" area. This is a covered storage area equipped with a sprinkler system. The area slopes to the south toward the old guard station. In the event of a 25-year storm, water could collect in this area to a depth that may affect the stored boxes. Building 991 has implemented controls for this area that include the use of metal pallets under the boxes, and the requirement to inspect the boxes following an event and repack as needed. Because the area is covered, the boxes stored are not subject to weather conditions on a regular basis.

The low area between Buildings 444 and 460 is on the east side of Building 460 in the area of the loading dock. The east side of the low area slopes steeply to a storm drain and is not suitable for storage purposes. The more level area is part of the traffic pattern for access to the dock. As such it is unlikely any storage of material will occur in this area.

Shallow flooding could occur in the vicinity of the 452 trailers due to deficiencies in the drainage along Central Avenue. This area has a high density of office trailers and it is unlikely storage of waste boxes would occur in the area.

7.7.5.3 Bases for Specific Controls for the Storage/Staging of Wooden Low-Level Waste Boxes

(The number in parentheses corresponds to the controls in Section 7.5.5.3, Table 7-9.)

(1) The number of wooden boxes and/or half-boxes that can be stored within 100 feet of a nuclear hazard Category 2 facility is restricted to ten (10) to limit the propagation of a fire involving the wooden waste crates to the nuclear hazard Category 2 facilities.

(2) The number of wooden boxes and/or half-boxes that can be stored/staged in one group is limited to 50, based on maintaining the mitigated risk in the Risk Class III and IV bins.

(3) The lack of combustible materials surrounding the stored boxes is credited for reducing the frequency in fire scenarios by minimizing the likelihood that a nearby fire could spread to LLW/LLMW boxes and by minimizing the amount of contributing combustible materials in the immediate area of storing/staging.

(4) The practice of separating groupings of boxes from other boxes and combustible material is credited for reducing the frequency in fire scenarios because of the lack of combustible material and the lack of an ignition source (a fire involving one group could be the initiator for another group). Separation will limit the number of boxes that could be involved in a fire or traffic accident.

(5) Maintaining separation between stored wooden waste boxes and fuel sources reduces the probability of a fire or explosion involving fuel storage tanks. Refueling operations are attended activities, and personnel will be present to respond to any fuel spill or other unplanned event.

(5) The presence of physical barriers is credited for reducing the frequency of a fire or explosion involving an array of boxes located adjacent of a roadway from an accident involving vehicular traffic. Boxes that are stored/staged near roadways (within 5 feet) are the most susceptible to traffic accidents. Given the relatively low vehicle speeds normally encountered on the site, physical barriers for all boxes within 5 feet of a roadway will provide protection for the boxes most at risk from vehicle traffic, without being unduly restrictive on facility operations.

(6) The separation of stored wooden waste boxes from ignition sources is credited for reducing the probability of a fire involving the boxes and an explosion adjacent to the boxes, with or without a fire.

(8) Limiting the distance between stored/staged wooden waste boxes and combustible powered motor vehicles reduces the probability of a fire initiated by problems with the vehicle(s) and the propagation of a fire event between box groupings.

(9) No specific credit is taken for fire retardant covers on the stored boxes; however, these covers will reduce the probability of sparks and embers from an initial fire in an adjacent fuel grouping from falling on and igniting other groupings. These covers also provide some protection from the weather elements.

(10) This control ensures that compliance with the other interim controls is maintained and documented, with any non-compliance identified and corrected.

7.7.6 Safety Management Program Bases

The safety infrastructure of RFETS is described in the Safety Management Programs and compliance with these programs is required to ensure worker safety during all aspects of operations and activities at the site.

3 SAFETY MANAGEMENT PROGRAMS

The authorization basis for Building 666 relies on adequate Site-level implementation of Site Safety Management Programs (SMPs) as defined in the Rocky Flats Environmental Technology Site Safety Analysis Report (Site SAR), Chapter 6. SMPs provide Site-level implementation of specific safety functions assumed in the safety analysis that are either specifically credited or recognized to be important for providing defense-in-depth. All of the identified SMPs and their Key Functional Elements are implemented at a Site level.

Building-specific implementation of some SMPs is required based upon the specific hazards identified in Section 4, Hazards and Accident Analyses. These SMPs are implemented using a graded approach that is focused on those specific attributes of the SMPs associated with identified hazards, hazard assumptions, and initial conditions presented in the safety analysis.

3.1 SMP RELATIONSHIP TO HAZARDS AND ACCIDENT ANALYSIS

The following sections delineate the relationship between the various Site-level SMPs and Building 666's current mission operation and the operation's related hazards.

3.1.1 Facility Participation In Site-Level Implementation of SMPS

Based on the current facility mission and those hazards identified for the facility mission, the facility participates in the following SMPs at a Site level:

- Integrated Safety Management
- Organization and Management
- Configuration Management
- Corrective Action
- Emergency Preparedness
- Engineering
- Environmental Management
- Independent Safety Review and Assessments
- Fire Protection
- Safety and Industrial Hygiene
- Maintenance
- Nuclear Safety[1]
- Occurrence Reporting
- Operations
- Quality Assurance
- Procedures
- Radiation Protection
- Records Management and Document Control
- Training and Qualification

1. Because Building 666 stores only LLW, a nuclear criticality accident scenario is deemed incredible due to waste container storage container loading and the form and composition of materials stored (ANSI, 1986).

3.1.2 SMPs Important to Hazards and Accident Analysis

This section describes the Safety Management Program (SMP) that is applicable to the safe operation of Building 666. The following SMP provides the basis for the identified hazards, hazard assumptions, and initial conditions in Section 4 Hazards and Accident Analysis:

Waste Management

Attributes of the Building 666 Waste Management and Environmental Protection Program focus on protecting human health (*e.g.*, the public and workers), and the environment during facility operations. The facility performs and documents waste management and environmental protection activities, such as routine surveillance, inspections, and aisle spacing, using the permit conditions of the Site Resource Recovery and Conservation Act (RCRA) permit (RFETS, 1997) as guidance. The facility adheres to the Toxic Substances Control Act regulatory requirements (TSCA) (RFETS, 1993, EPA, 1989, CFR, 1993a, CFR, 1993b).

3 SAFETY MANAGEMENT PROGRAMS

The authorization basis for Building 881 relies on adequate Site-level implementation of Site Safety Management Programs (SMPs) as defined in the Rocky Flats Environmental Technology Site Safety Analysis Report (Site SAR), Chapter 6. SMPs provide Site-level implementation of specific safety functions assumed in the safety analysis that are either specifically credited or recognized to be important for providing defense-in-depth. All of the identified SMPs and their Key Functional Elements are implemented at a Site level.

Building-specific implementation of some SMPs is required based upon the specific hazards identified in Section 4, Hazards and Accident Analyses. These SMPs are implemented using a graded approach that is focused on those specific attributes of the SMPs associated with identified hazards, hazard assumptions, and initial conditions presented in the safety analysis.

3.1 SMP RELATIONSHIP TO HAZARDS AND ACCIDENT ANALYSIS

The following sections delineate the relationship between the various Site-level SMPs and Building 881's current mission operation and the operation's related hazards.

3.1.1 Facility Participation in Site-Level Implementation of SMPs

Based on the current facility mission and those hazards identified for the facility mission, the facility participates in the following SMPs at a Site level:

- Integrated Safety Management
- Organization and Management
- Configuration Management
- Corrective Action
- Emergency Preparedness
- Engineering
- Environmental Management
- Independent Safety Review and Assessments
- Maintenance
- Occurrence Reporting
- Operations
- Quality Assurance
- Procedures
- Radiation Protection
- Training and Qualification
- Records Management and Document Control

3.1.2 SMPs Important To Hazard and Accident Analysis

This section describes the Safety Management Programs (SMPs) that are applicable to the safe operation of Building 881. The following SMPs provide the bases for identified hazards, hazard assumptions, and initial conditions in the Section 4 Hazards and Accident Analysis:

- Safety and Industrial Hygiene

Attributes of the Hazardous Material Protection Program important to Building 881 focus on protecting the immediate worker from exposure to hazardous materials and maintaining the facility's hazard classification.

Controls are placed on the Building 881hazardous material inventory to prevent the introduction of materials into the facility that would invalidate the safety analysis basis of the facility. Safe management of chemicals at RFETS, including site-wide inventories, controls on small-quantity deliveries, and adherence to Site-specific Emergency Preparedness chemical screening thresholds, is effected through the Chemical Life-Cycle Program (CLP), as codified in the RFETS Chemical Management Manual (RFETS, 1999b).

- Waste Management

Attributes of the Building 881 Waste Management and Environmental Protection Program focus on protecting human health (*e.g.*, the public and workers), and the environment during facility operations. The facility performs and documents waste management and environmental protection activities, such as routine surveillance and inspections, in accordance with the permit conditions of the Site Resource Recovery and Conservation Act (RCRA) permit (RFETS, 1997). Additionally, reactive chemical treatment process activities comply with RCRA Reactive Chemical Treatment Process treatment unit specific conditions (e.g., operating capacity, secondary containment, etc.) (RFETS, 1998b).

- Fire Protection

Important attributes of the Fire Protection Program for Building 881 focus on combustible loading and ignition control. The attributes specifically identified for Building 881 consists of various aspects of the functional elements interrelated into processes to (a) control combustible loading by work planning and control and housekeeping, (b) control ignition sources, (c) establish periodic fire inspections and tours, and (d) maintain alarm and alarm transmission capability to the Fire Department.

The Building 881 fire hazard and nuclear safety analyses place importance on combustible material control and ignition source control programs to ensure that large fires do not occur. Thus, the Fire Protection Program facilitates determining acceptable combustible material loading in various areas and performing and documenting appropriate surveillances. Another important aspect is to control introduction and ensure prompt removal of transient combustible materials.

- Nuclear Safety

Important attributes of the Nuclear Safety Program for Building 881 focus Criticality Safety. A nuclear criticality accident is deemed incredible for Building 881 due to waste container storage loading and the form and composition of materials stored (ANSI, 1986). The CAAS has been removed from Building 881 based upon the current configuration of the facility and the estimated holdup. Therefore, the facility must ensure that the current configuration of the ducting is maintained.

3 SAFETY MANAGEMENT PROGRAMS

The safety analysis for RCRA Storage Units relies on facility implementation of Site Safety Management Programs (SMPs) as defined in the Rocky Flats Environmental Technology Site Safety Analysis Report (Site SAR), Chapter 6. These SMPs provide specific safety functions assumed in the safety analysis that are either specifically credited or recognized to be important for providing defense-in-depth. All of the identified SMPs and their Key Functional Elements are implemented at a Site level.

The RCRA Storage Units implement the Site-level SMPs using a graded approach based upon the specific hazards identified in Section 4, *Hazard and Accident Analyses*. The facility focuses its graded approach implementation on those specific attributes of the SMPs associated with identified hazards, hazard assumptions, and initial conditions presented in the safety analysis.

3.1 SMP RELATIONSHIP TO HAZARDS AND ACCIDENT ANALYSIS

The following sections delineate the relationship between the various Site-level SMPs and RCRA Storage Unit's current mission operation and the operation's related hazards.

3.1.1 Facility Participation in Site SMPs

Based on the current facility mission and those hazards identified for the facility mission, the facility participates in the following SMPs at a Site level:

- Integrated Safety Management
- Organization and Management
- Configuration Management
- Corrective Action
- Emergency Preparedness
- Engineering
- Environmental Management
- Independent Safety Review and Assessments
- Fire Protection
- Safety and Industrial Hygiene
- Maintenance
- Nuclear Safety[1]
- Occurrence Reporting
- Operations
- Quality Assurance
- Procedures
- Radiation Protection
- Records Management and Document Control
- Training and Qualifications

1. Because the RCRA Storage Units store only LLW, a nuclear criticality accident scenario is deemed incredible due to waste container storage container loading and the form and composition of materials stored (ANSI, 1986).

3.1.2 SMPs Important To Hazard and Accident Analysis

This section describes the Safety Management Programs (SMPs) that are applicable to the safe operation of the RCRA Storage Units at Rocky Flats. The following SMP is specifically

important to the Section 4 Hazards and Accident Analysis (*e.g.*, identified hazards, hazard assumptions, and initial conditions):

Waste Management:

Attributes of the RCRA Units Waste Management Program focus on protecting human health (*e.g.*, the public and workers), and the environment during facility operations. The facility performs waste management and environmental protection activities, such as routine surveillance and inspections, in accordance with the permit conditions of the Site Resource Recovery and Conservation Act (RCRA) permit (RFETS, 1995a).